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ARMY CONCEPT TEAM IN VIETNAM  
APO San Francisco 96243

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**EMPLOYMENT OF CV-2B  
COMPANY IN COUNTER -  
INSURGENCY OPERATIONS (U)**

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ARMY CONCEPT TEAM IN VIETNAM  
APO San Francisco 96243

FINAL REPORT. 1 May 64 - 31 Oct 64.

EMPLOYMENT OF CV-2B COMPANY  
IN COUNTERINSURGENCY OPERATIONS. (U)

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765th Transportation Battalion  
61st Aviation Company  
5th Special Forces Group

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## I. (U) PREFACE

### A. ABSTRACT

Data on the CV-2B (Caribou) company were collected by the Army Concept Team in Vietnam (ACTIV) during counterinsurgency operations in the Republic of Vietnam (RVN) from 1 May to 31 October 1964. The data analyzed in the present report supplement data discussed in the ACTIV final report, "Caribou Airplane in Support of Counterinsurgency Warfare" (U), dated 30 August 1963.

The ACTIV project officer and evaluators participated as crew members on each type of mission flown in each of the corps zones. Their observations, interviews, and official records form the basis of this report. No missions were generated solely for the purpose of collecting data.

The CV-2B, under operational control of the corps senior advisors, special forces in Vietnam, or United States Overseas Mission (USOM), provided effective and responsive support to counterinsurgency operations in Vietnam.

The short takeoff and landing (STOL) characteristics of the CV-2B aided by reversible pitch propellers, its capability to fly in and out of short airstrips under all but the most severe weather conditions, and its maneuverability in restricted terrain, rendered the Caribou exceptionally well-suited for sustained support of counterinsurgency operations in Vietnam. Reversible pitch propeller modification and AN/ANP-158 (WP-103) weather avoidance radar enhanced the effectiveness of the CV-2B in Vietnam.

The low-level extraction (LOLEX) technique for aerial delivery of cargo provided flexibility in selection of delivery methods, resulted in a significant reduction in cost of air items (equipment needed to rig for aerial delivery), and reduced rigging and recovery time.

Data collected in the areas of operations, supply, and maintenance indicated that TOE 1-59D, Aviation Company (Airmobile - Fixed-Wing), dated 27 March 1964, is inadequate for counterinsurgency operations.

### B. OBJECTIVES AND METHODS

#### 1. Objective 1 - Operations

Document the operations of the CV-2B Caribou company and the support provided to the counterinsurgency effort in Vietnam.

Methods for meeting Objective 1 were:

- 1) Statistical data were gathered from official records and reports. Interviews were made with operational and maintenance personnel.
- 2) Evaluators and the project officer flew each type of mission in each corps zone, recorded specific data, and made general observations.

2. Objective 2 - Airdrop Techniques

Evaluate the airdrop techniques used by the Caribou company.

Methods for meeting Objective 2 were:

- 1) Observation was made of each technique. Specific data concerning accuracy of delivery were recorded. Interviews were made with special forces personnel who received the bulk of the supplies delivered.
- 2) An evaluator or the project officer flew as a crew member/observer on missions employing each type of aerial delivery technique.

3. Objective 3 - Evaluation of TOE

Evaluate the TOE under which the Caribou company operated.

Methods for meeting Objective 3 were:

- 1) Interviews were made with key personnel of the 61st Aviation Company and the Aviation Support Battalion.
- 2) Records were searched.
- 3) Observations of the suitability of the TOE were made.

4. Objective 4 - Logistics

Document the logistical support requirements for the Caribou company employed in support of counterinsurgency operations in Vietnam.

Methods for meeting Objective 4 were:

- 1) Interviews were conducted.
- 2) Records were searched.
- 3) Observations of the supply system were made.

## 5. Objective 5 - Navigation and Communications Equipment

Document the operational use of navigation and communications equipment installed on the CV-2B Caribou.

Methods for meeting Objective 5 were:

- 1) Interviews were conducted with crews and communications personnel.
- 2) Observations were made during operational missions.

## C. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

The CV-2B demonstrated its versatility in the movement of troops and cargo in and to the outlying areas of Vietnam. Its cargo capacity and its operational capabilities, when coupled with the LOLEX delivery technique, made it extremely valuable for resupplying isolated special forces camps and long-range patrols.

Since the 5th Special Forces Group has a routine requirement for US Army aerial support, CV-2B's should be allocated to the group. In order to increase effectiveness, simplify maintenance, and provide flexibility in aircraft scheduling, the modification to equip all Caribous in Vietnam with reversible pitch propellers should be expedited. Since the counterinsurgency situation in Vietnam precludes an elaborate radar network, CV-2B's operating in a counterinsurgency environment should be equipped with weather avoidance radar. In addition, during periods of poor visibility, some type of portable terminal guidance equipment should be provided to assist aircraft in locating the positions of isolated units operating in remote areas. The technique of placing the CV-2B under operational control of the supported units proved effective and responsive and should be considered as the normal means of control in a counterinsurgency situation. TOE 1-59D, Aviation Company (Air-mobile - Fixed-Wing), dated 27 March 1964, should be augmented with additional personnel and equipment for counterinsurgency operations in order to provide an adequate command control and an effective maintenance structure.



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## II. (C) INTRODUCTION

### A. PURPOSE

The purpose of this evaluation was to collect and analyze data on performance of the US Army CV-2B (Caribou) company during support of counterinsurgency operations in the Republic of Vietnam (RVN).

### B. BACKGROUND

The 1st Aviation Company (Fixed-Wing Light Transport) was deployed from CONUS to Joint Task Force 116 in Thailand on 23 July 1962. The company was moved to Vung Tau, Vietnam in December 1962 to support counterinsurgency operations in the RVN. A second Caribou company, the 61st Aviation Company (Fixed-Wing Light Transport), was self-deployed from the United States, arriving in Vung Tau in July 1963.

The first evaluation of the Caribou in support of counterinsurgency operations was conducted by the Army Concept Team in Vietnam (ACTIV) from 1 February to 31 July 1963. The final report covering the first evaluation, "Caribou Airplane in Support of Counterinsurgency Operations" (U), dated 30 August 1963, was distributed in September 1963.

The 1st Aviation Company was returned to the United States in December 1963. The 61st Aviation Company, however, continued to support the counterinsurgency effort in Vietnam, with the aircraft placed under operational control of the corps senior advisors. A second Caribou company arrived in Vietnam on 23 October 1964 but was not operational during the evaluation period.

The second evaluation was conducted from 1 May to 31 October 1964 and covers operations of the 61st Aviation Company.

### C. SCOPE

#### 1. Definition of Project

Particular emphasis during the evaluation was placed on:

- a) Support provided to US advisor teams, Army of the Republic of Vietnam (ARVN) corps and divisions, special forces, and the United States Overseas Mission (USOM)
- b) Command and control
- c) Aviator training

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- d) Airdrop techniques
- e) Flight techniques
- f) TOE
- g) Logistical support requirements
- h) Navigation, communications, and radar equipment installed on the CV-2B.

## 2. Setting of Project

### a. Environment

The 61st Aviation Company provided support to US advisory teams, 5th Special Forces Group, ARVN, and USOM in all corps areas of the Republic of Vietnam. The Caribou flew operational missions under all but the most severe weather conditions in Vietnam, and used airfields located in all types of terrain. During the evaluation period, part of the 61st Aviation Company was flying in an area of Vietnam affected by the southwest monsoon rains while the remainder was flying in an area not affected by the monsoon. Where the physical environment had significant effect on operations, the facts have been noted. See annex A for a discussion of the enemy, weather, and terrain.

### b. Military Elements

#### (1) Units

The documentation of operations of the 61st Aviation Company forms the basis of this report. Data were also gathered from the following units:

- a) 326th Maintenance Detachment
- b) 611th Direct Support Company
- c) 330th General Support Company
- d) 5th Special Forces Group

#### (2) Equipment

The CV-2B, modified with reversible pitch propeller, was the aircraft evaluated. The items used for low-level extraction (LOLEX) were standard air items procured by and for the special forces. The WP-103 weather avoidance radar was installed on three CV-2B's. No special equipment was procured during the evaluation.

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## (3) Mission

The mission of the 61st Aviation Company as stated in MACV Directive Number 44, dated 11 December 1963, is to provide aircraft in the corps tactical zones (CTZ) as directed, in direct support of corps for forward area transport.

## D. EVALUATION DESIGN

The primary sources of data for the evaluation of the CV-2B were observation of and documentation of the administrative, operational, and maintenance activities of the 61st Aviation Company. Information was drawn not only from official records, reports, and summaries, but was also acquired from reports of operational missions flown by the project officer and evaluators.

Descriptions of flight techniques, support missions performed by the CV-2B, and maintenance and supply procedures were developed from observations and interviews. Investigation of aircraft availability, maintenance man-hours expended, and number and types of support missions flown resulted in numerical data which were tabulated and analyzed.

### 1. Methodology

#### a. Data Collection Methods

Data were extracted from unit records, reports, and summaries, and were placed on ACTIV forms specially designed for the evaluation. Two additional forms were designed to record data on operational missions. These data, interviews with key personnel, debriefing of crews, and opinion samplings were recorded both on questionnaires and in narrative form. Data collection forms are shown in annex F.

#### b. Analysis Methods

Narrative and functional descriptions provided the sources for qualitative analyses. Opinion sampling was a secondary means. Quantitative analysis was based on unit records.

### 2. Limitations and Variables

Missions were not scheduled solely for the purpose of generating data. Under the operational conditions prevailing in the RVN, the nature of the data collected required empirical rather than theoretical forms of analysis.

### 3. Support Requirements

Support requirements were provided as directed in Military

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Assistance Command (MACV) letter MACJ311, dated 8 June 1964, subject: Evaluation of the CV-2B Company in Counterinsurgency Operations.

4. Time Schedule

The Caribou company was in-country and performing operational missions prior to the initiation of the present evaluation. Evaluators joined the 61st Aviation Company after they had received two days of orientation. Data were collected and analyzed during a 195-day period.

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### III. (C) DISCUSSION

#### A. (C) OBJECTIVE 1 - OPERATIONS

##### 1. Command and Control

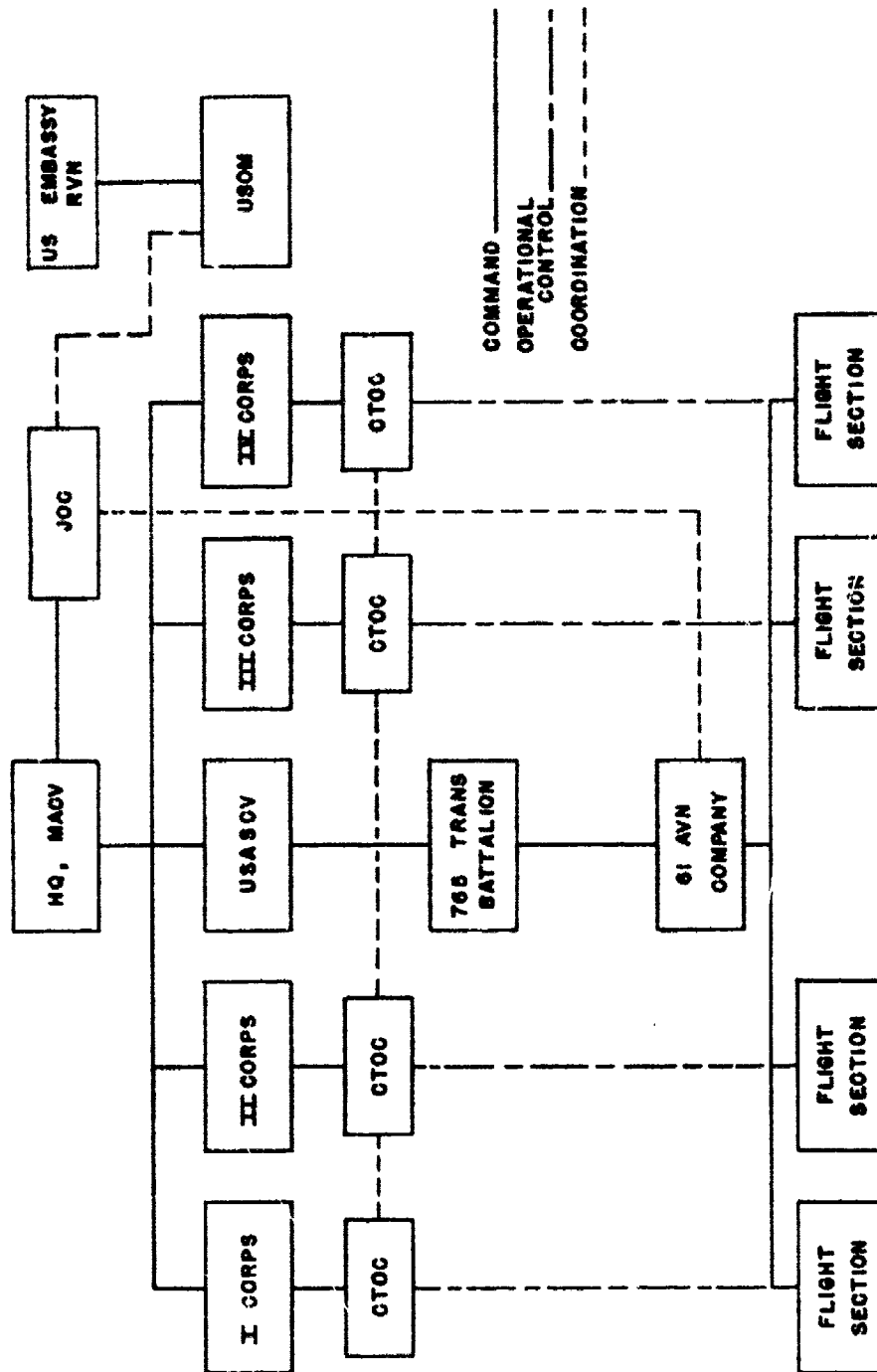
The 61st Aviation Company (Fixed-Wing Light Transport) was attached to the 765th Transportation Battalion (formerly the Support Battalion). The battalion commander exercised command, but not operational control of unit aircraft. The US Army aviation element of the Joint Operations Center (JOC) had the authority to coordinate directly with the 61st Aviation Company on matters pertaining to allocation and employment of CV-2B aircraft. (See figure 1.)

The corps senior advisors were allocated most of the available CV-2B's and were responsible for stationing and controlling aircraft and for assigning missions. The corps senior advisors exercised operational control through the US Army aviation element within the corps tactical operations center (CTOC). Missions were received and approved at the CTOC. Approved preplanned missions were coordinated with the flight sections of the 61st Aviation Company the day before execution. Add-on missions, emergency missions, or changes in missions were assigned directly to the aircraft commander by the CTOC. Personnel of the US Army aviation element at CTOC conducted briefings as considered necessary. Reaction time to a mission for aircraft on stand-by was the sum of briefing and takeoff time. When sufficient time was not available it was standard procedure to brief the crews over the telephone or by radio after the aircraft was airborne. The CTOC could communicate with the aircraft through the CTOC FM net. A change in mission could be transmitted directly from CTOC to the aircraft. When USOM and special forces were allocated CV-2B aircraft, these agencies exercised operational control.

Military Assistance Command, Vietnam message, MACJ324, dated 16 September 1964, allocated CV-2B aircraft with the following priorities:

<u>Using Agency</u>	<u>Number of Aircraft</u>	<u>Priority</u>
USOM	1	1
Senior advisor I Corps	3	6, 10, 14
Senior advisor II Corps	3	5, 9, 13
Senior advisor III Corps	3	3, 7, 11

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(U) FIGURE 1. Command and control structure for allocation and employment of CV-2B aircraft in RVN.

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<u>Using Agency</u>	<u>Number of Aircraft</u>	<u>Priority</u>
Senior advisor IV Corps	3	4, 8, 12
JUSMAAGTHAI (Bangkok)	1	2
General support	1	15
61st Aviation Company	<u>1</u>	16
Total	16	

The 16th aircraft, although allocated to the 61st Aviation Company for training, was never available because of the low priority.

When necessary, MACV temporarily changed aircraft allocations to meet urgent requirements for additional aircraft in a particular area of operations. The aircraft were then returned to the agency having initial control as soon as the requirement was satisfied.

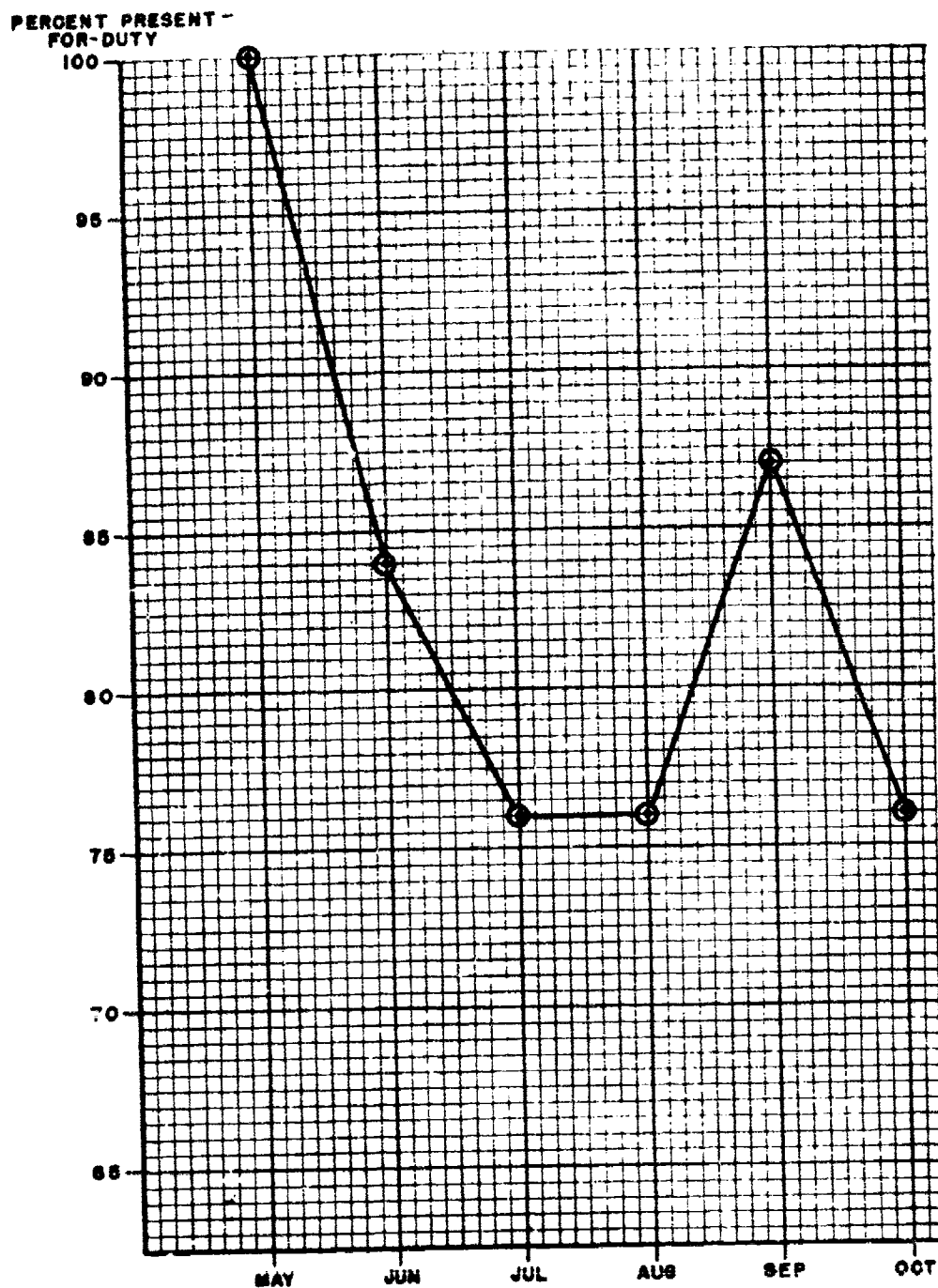
Aircraft were stationed in accordance with the desires of the senior advisor in accordance with the tactical situation. The 61st Aviation Company, minus the one flight platoon allocated to I and II Corps, was located at Vung Tau and provided support to III and IV Corps from this location. For increased response, the aircraft allocated to I Corps were stationed at Da Nang, where I Corps Headquarters was located. Aircraft for II Corps were located at Pleiku, home of II Corps. (See figure 2.)

## 2. Training

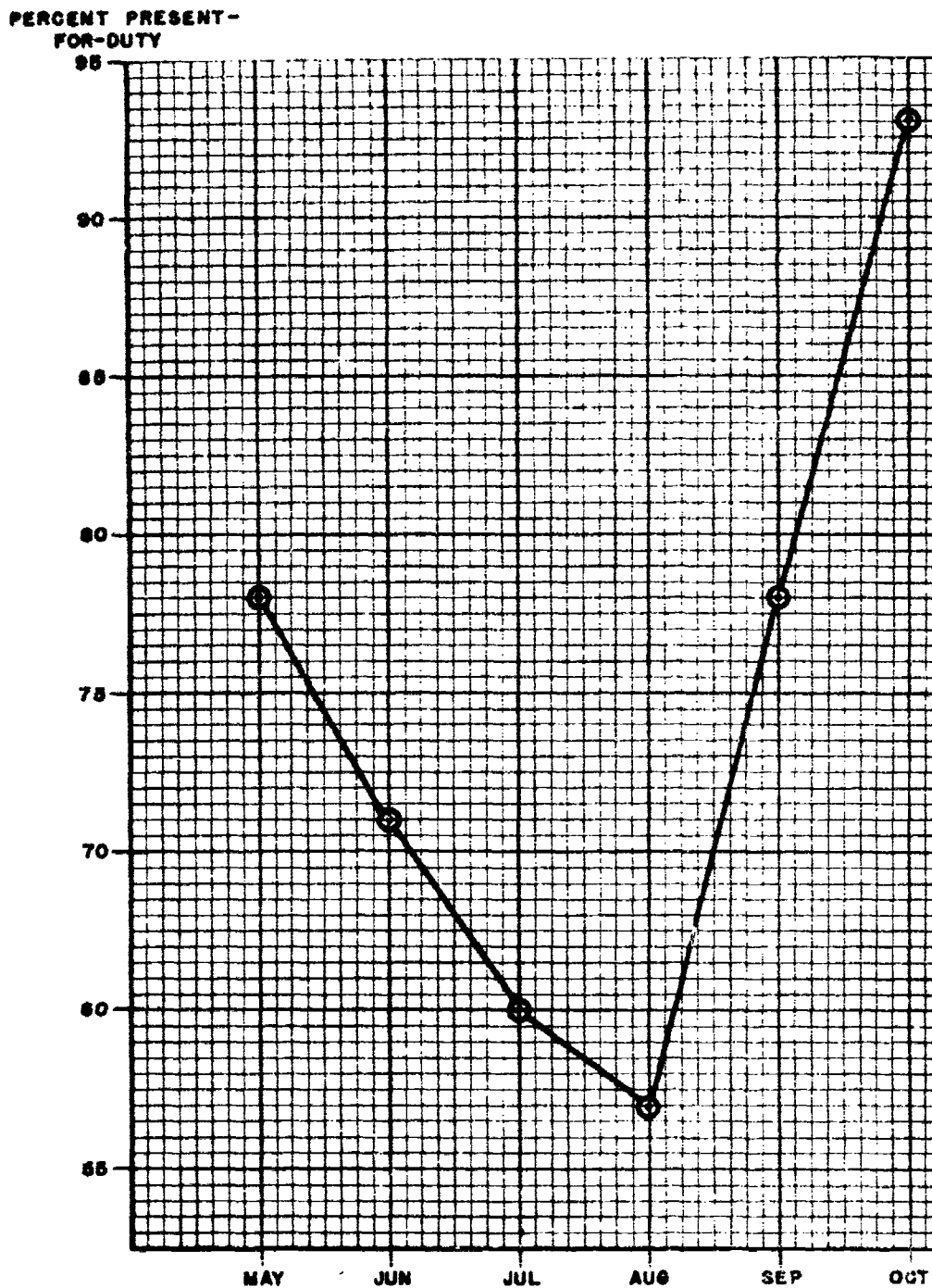
When the 61st Aviation Company was deployed to Vietnam in July 1963, the unit was at full strength in both officers and enlisted men. The problem resulting from all original personnel returning home at the same time was anticipated and a plan was developed to return the officers and enlisted men in three increments. One increment would return at the end of the eleventh, twelfth, and thirteenth months, respectively. There was also an attempt to ensure continuity through the intra-theater transfer of personnel. Rotation commenced in May 1964 and was completed in August 1964. However, a delay in receiving officer and enlisted replacement adversely affected both the maintenance and operational capabilities of the unit. Figures 3 and 4 show the percent present-for-duty strength of aviators and mechanics during the evaluation. Shortages, coupled with the receipt of many replacement officers and enlisted men with little or no operational experience, placed a severe training load on the organization, while operational requirements remained unchanged. Aircraft availability, as recorded on DA Form 1352, was not affected. Maintenance personnel worked nights and weekends to maintain the maximum number of flyable aircraft.







(U) FIGURE 3. Present-for-duty aviator strength during the evaluation.



(U) FIGURE 4. Present-for-duty aircraft mechanic strength during the evaluation.

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The experience level of newly assigned aviators varied widely. Figure 5 shows the total fixed-wing and CV-2B flying times of pilots and copilots for all replacement aviators on their arrival in Vietnam.

The tactical situation and the type of flying in Vietnam required that newly assigned aviators be given a detailed orientation in operational and communications procedures, the terrain, weather, and airfields. Many aviators required additional instruction in short take-off and landing (STOL) procedures. The amount of time required before an aviator was operationally qualified varied with the individual and was not related to his previous flying time. Because the aircraft allotted was not actually available to the unit for training, all checkouts were conducted in conjunction with operational missions. This procedure, although adequate for local orientation, added many weeks and hours of unproductive straight-and-level flying time before an aviator was qualified. It required an average of 40 hours flying time and 27 days to complete a checkout while flying operational missions. The 16th aircraft, originally intended for training, was never available because aircraft availability was never 100 percent. The unit standardization officer estimated that the average time for qualification could have been reduced to 3 days and about 10 hours flying time if a training aircraft had been available.

The instructor-pilots of the 61st Aviation Company found two main areas of weakness in the training of replacement aviators: Unfamiliarity with the total capabilities of the aircraft, and a lack of proficiency in STOL. Operational flying in the counterinsurgency environment in Vietnam called for complete familiarity with the aircraft and a high proficiency in STOL.

Transition from peacetime flying to operational flying in Vietnam required that each aviation unit organize and maintain a standardization program, not only for new arrivals, but for the more experienced aviators. Each aviator in the 61st Aviation Company was required to take one standardization flight each month with an instructor pilot. This flight, like all other training, was conducted during a regular combat support mission.

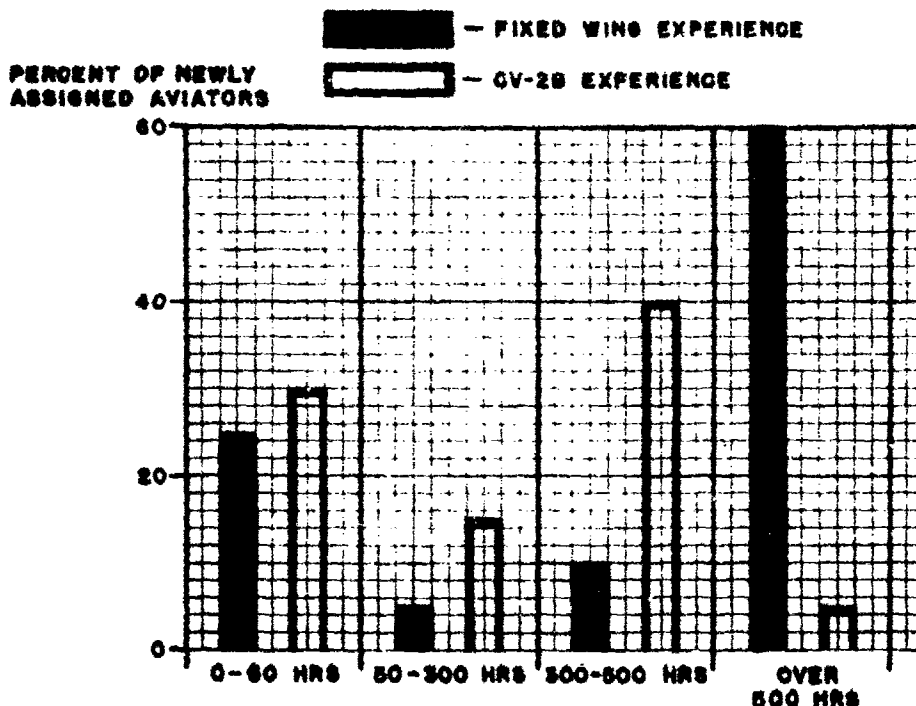
Although training conducted concurrently with operational missions succeeded in producing a thoroughly oriented and confident pilot, it had the disadvantages of extending the checkout period, overworking the instructor pilots, and producing an unnecessary flight safety hazard.

### 3. CV-2B Support Provided to US Advisor Teams

The Caribou allocated to the corps senior advisors were employed similarly in each corps zone. Forward area resupply of isolated advisor teams and special forces strike companies, medical evacuation,

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(U) FIGURE 5. Aviator experience level upon joining company.

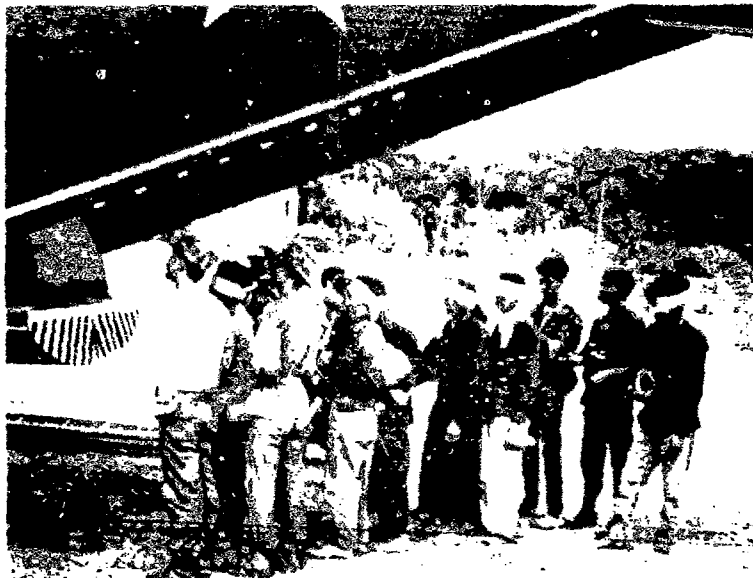
displacement of command posts, and transportation of Viet Cong captives (figure 6), RVN troops, and their dependents were the missions normally assigned to the flight sections.

In II, III, and IV Corps, routine missions were accomplished using a system of scheduled courier flights to each of the airfields. Recurring transportation requirements were not heavy enough to justify scheduled courier flights in I Corps. All flights in I Corps were scheduled on a mission basis as approved by CTOC.

Medical evacuation by Caribou was normally preplanned for large scale operations. Helicopters transported casualties to the closest airstrip where they were evacuated by Caribou to the nearest hospital. This procedure maximized the use of helicopters by shortening their turnaround time. (See figure 7.)

Delivery of supplies by paradrop was more frequent in I, III, and IV Corps area. In II Corps, where the special forces had a LOLEX rigging capability at their supply base at Nha Trang, the paradrop requirement was less frequent. Low-level extraction was more effective and more economical than the paradrop methods. (See objective 2.) Figures 8 and 9 show the amount and type of support provided to each of the four corps.

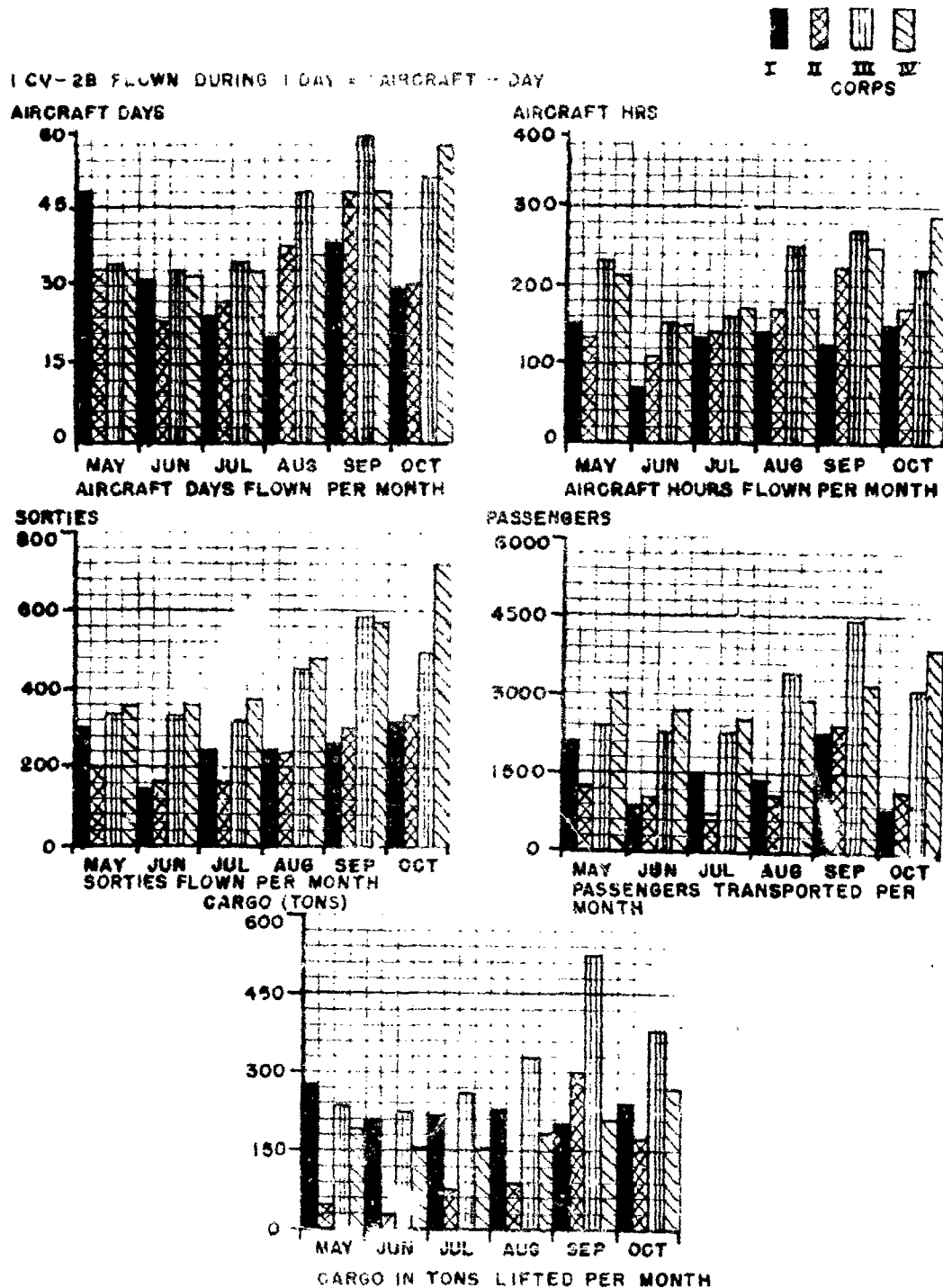
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(U) FIGURE 6. Viet Cong captives boarding a Caribou.



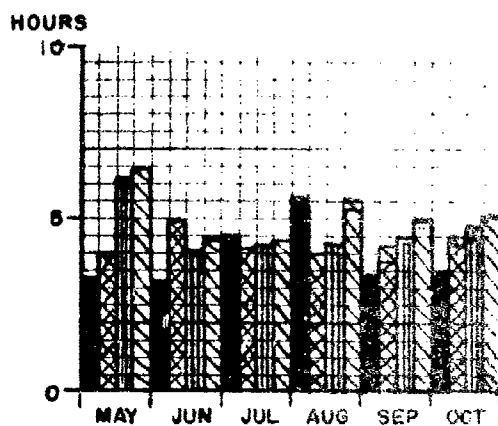
(U) FIGURE 7. Special forces medic prepares a Montagnard man for medical evacuation.



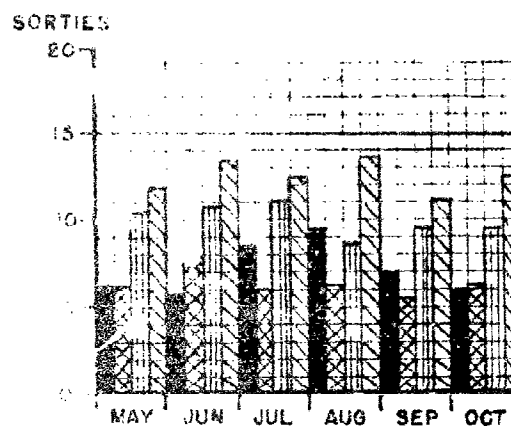
(U) FIGURE 8. CV-2B support provided to corps.

1 CV-28 FLOWN DURING 1 DAY = 1 AIRCRAFT-DAY

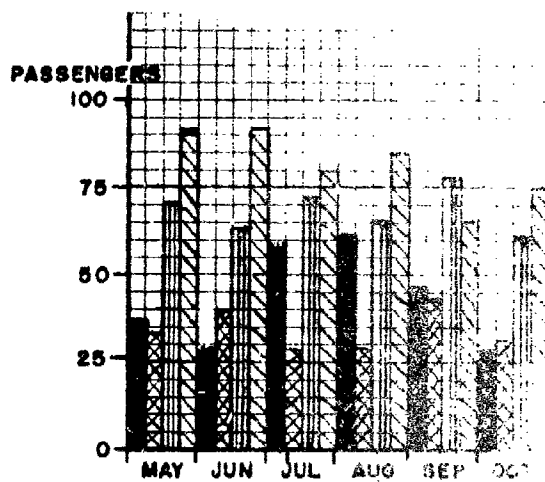
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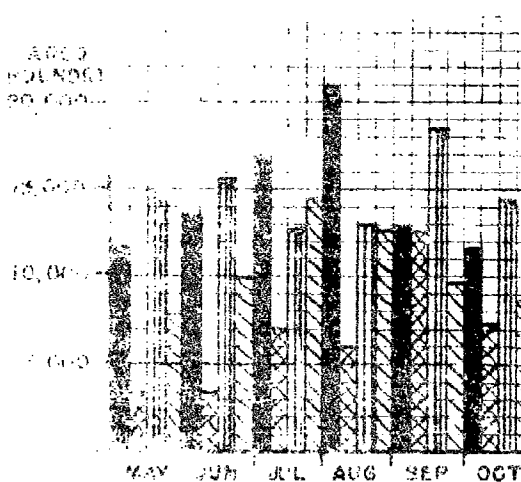
AVERAGE FLYING TIME (HOURS)  
PER AIRCRAFT-DAY



AVERAGE NUMBER OF SORTIES  
PER AIRCRAFT-DAY



AVERAGE NUMBER OF PASSENGERS  
PER AIRCRAFT-DAY



AVERAGE CARGO (POUNDS)  
TRANSPORTED PER AIRCRAFT-DAY

(U) FIGURE 9. Work performed per aircraft-day in each corps.



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Narrative descriptions of typical CV-2B missions are in annex B. Annex C contains corps senior advisors' comments relative to US Army CV-2B support provided.

## 4. CV-2B Support Provided Special Forces

Special forces detachments were under operational control of the senior advisor of the corps in which they were located. Caribou support was requested by special forces and provided on a mission basis from the aircraft allocated to the corps. Each mission requested was either approved or disapproved by the CTOC based on the immediate situation.

There were 42 "A" and 4 "B" special forces detachments in Vietnam. Thirty-six were located on or near airfields. The Caribou with reversible pitch propellers could land at all of these airfields except Hai Yen in IV Corps which was too narrow to permit turnaround.

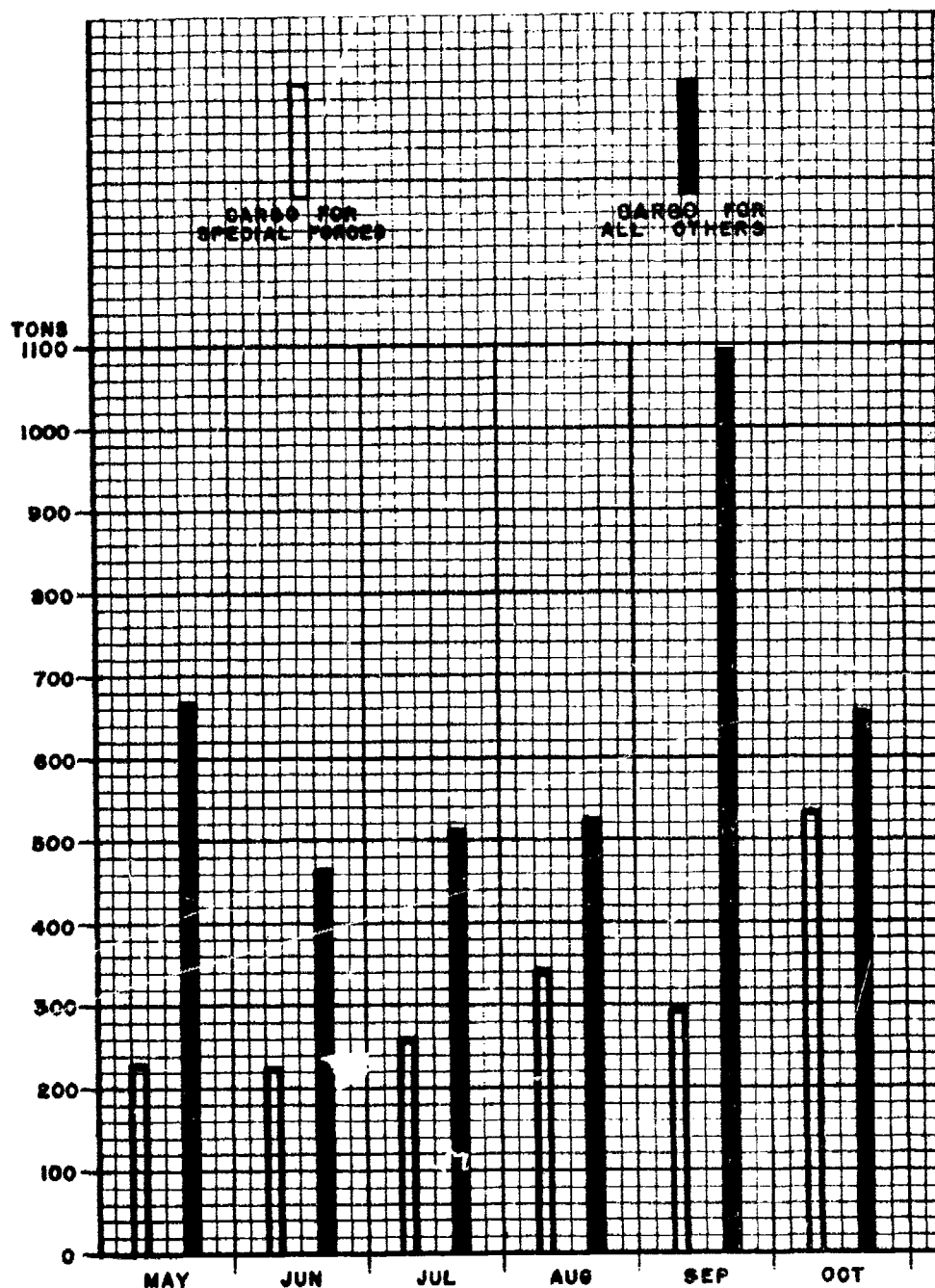
Approximately 72 percent of the special forces aerial resupply effort originated at the Special Forces Logistical Support Center at Nha Trang. The supplies were flown directly to the "A" detachments in the field. No CV-2B aircraft were specifically allocated to the center. Support from Nha Trang was limited to special or opportune missions and when requested by "B" detachments using an aircraft made available by the corps senior advisor.

Figure 10 portrays the amount of cargo in tons, divided into that delivered to special forces and to all other users, that was transported by CV-2B during the evaluation. This support was provided by aircraft allocated to the corps. Figure 11 portrays the frequency relationship, by percent, of the methods used to deliver cargo to special forces detachments.

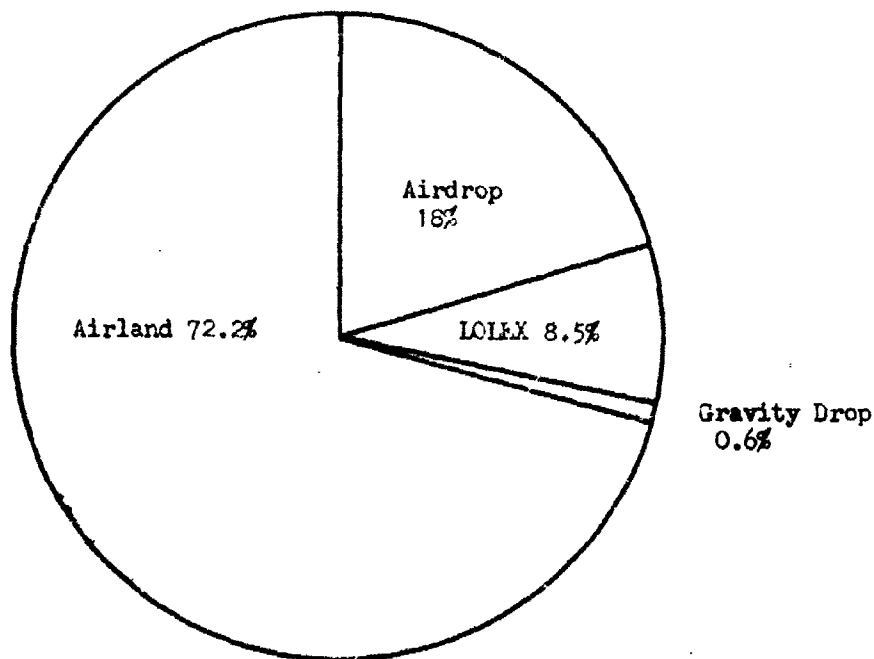
Using all types of aircraft that were available, special forces delivered by paradrop approximately 920,000 pounds of all types of supplies each month. According to estimates of special forces headquarters approximately 552,000 pounds, or 60 percent, of the supplies that were airdropped could have been airlanded or delivered by LOLEX using CV-2B aircraft. Comments of the commanding officer, 5th Special Forces Group, relative to CV-2B support are in annex C.

## 5. Other CV-2B Support Provided

CV-2B aircraft were allocated to USOM on a mission basis. These missions were generally in support of civic action programs throughout Vietnam. Blankets for Montagnard tribes, well digging rigs, and sugar cane sprouts are examples of the type of cargo transported. The crew reported to the senior USOM official for briefing. This official maintained operational control of the aircraft until the mission was completed.



(U) FIGURE 10. Cargo delivered by CV-2B to special forces compared to cargo delivered to all other users during the evaluation.



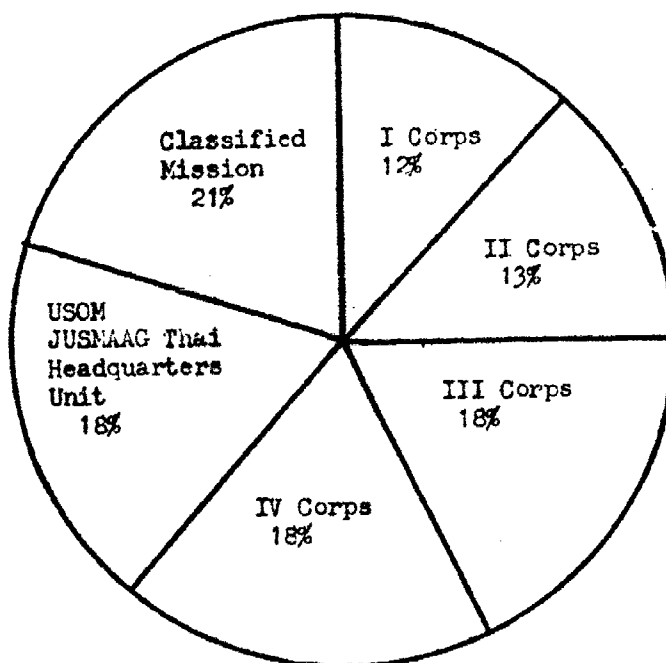
(U) FIGURE 11. Frequency relationship of delivery methods.

A classified out-of-country mission to provide five aircraft, less crews, to a US Government agency for an indefinite period was received in May 1964. On 27 May 1964, three aircraft left Vietnam, followed by two more on 5 June 1964. The crews and maintenance support were provided by the gaining agency. The loss of these aircraft reduced the support available in-country accordingly. Figure 8 indicates the marked increase in support starting 1 September when the mission was terminated for the 61st Aviation Company.

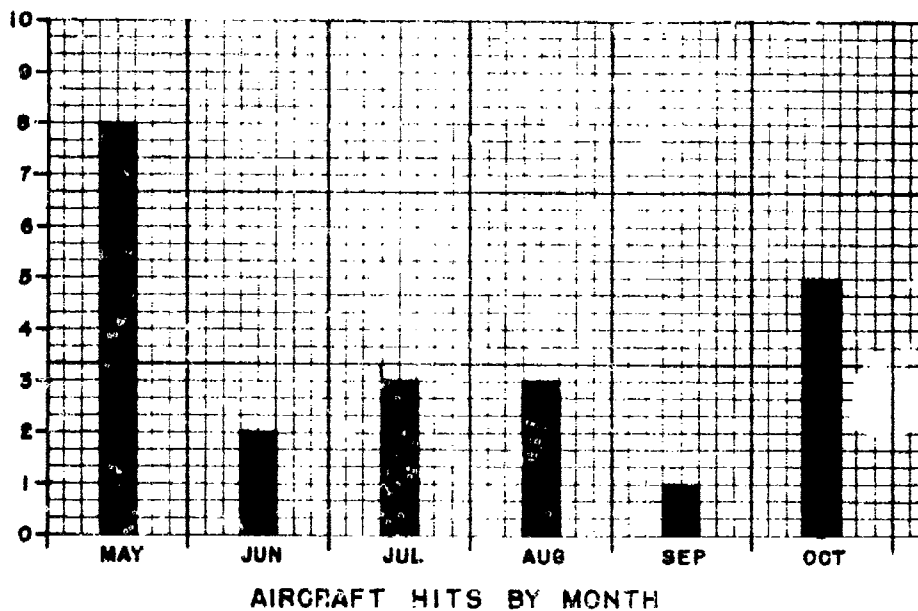
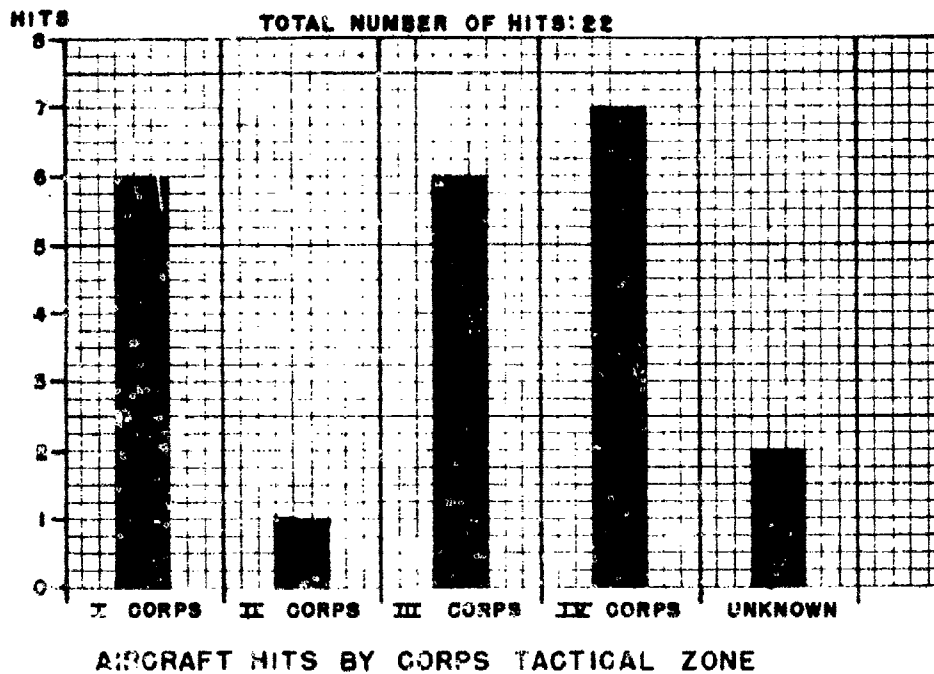
#### 6. Total CV-2B Support Provided

The majority of the missions flown during the evaluation were in direct support of the four corps. Forward area support was provided in varying weather conditions, enemy situations, and terrain. The Caribou was able to land at all but one airfield in Vietnam as listed in the MACV directory of airfields. No attempt was made to measure the effectiveness of the CV-2B in terms of total passengers or total tonnage carried. Mission effectiveness could only be related in terms of responsiveness to the commander and mission accomplishment. Figure 12 shows the distribution of support provided from 1 May to 31 October 1964 in terms of flying hours. Special forces support is included in the corps figures.

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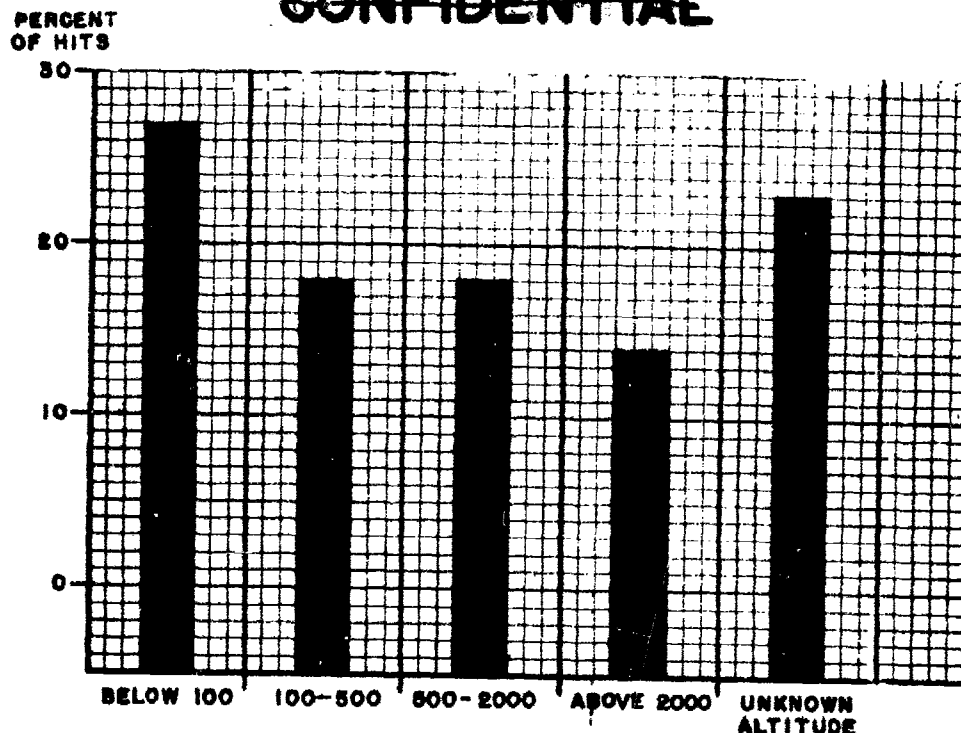


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(U) FIGURE 13. Aircraft hits by corps and by month.

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(U) FIGURE 14. Aircraft hits at various altitudes.

aircraft were able to complete their mission before returning for repairs. There were three hits received in the pilot's compartment, with injuries sustained by a pilot and a copilot. Two passengers were injured from ten hits received in the cargo compartment.

Standard aircraft approach to an airfield was at 2,500 feet altitude, with a rapid letdown to 2,000 feet at 110 knots airspeed as the aircraft passed over the field. A 270 or 180 degree approach was then executed with 15 degrees of flaps on the turn to downwind, and a gradual slowing of the aircraft. A close-in steep approach was made with 30 degrees of flaps applied on base leg. If necessary, 40 degrees of flaps were used on the final approach. This steep, slow, close-in approach kept the aircraft within forced landing distance of the airfield and away from possible VC antiaircraft teams that might be operating in the vicinity. When ceilings were below 1,000 feet in the delta region, the Caribou flew in the clouds enroute, letting down to contact conditions as the aircraft neared the point of intended landing. In the mountains, contour flying was used. (See objective 5 for a discussion of low-level navigation in Vietnam.)

The amount of antiaircraft fire received varied with the aggressiveness of the VC and the flight techniques used by the crews. Crew members wore flak jackets, and some armor protection was provided in the pilot's compartment. In Vietnam it was not necessary to provide

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air cover or suppressive fire to protect the Caribou while performing any of the assigned missions. However, on occasions, air cover was available.

## 8. Conclusions

a. CV-28's allocated to each corps and operating under the operational control of the corps senior advisor provided a flexible and responsive means of accomplishing the aerial movement of personnel and supplies in the corps forward areas.

b. CV-28 qualified aviators arriving in Vietnam received a comprehensive area checkout and required additional flight instruction in SIOI procedures before they were released for operational missions.

c. One CV-28 allocated to the company for training would expedite the operational checkout of aviators and provide a more effective unit standardization program.

d. The CV-28 was able to lift and supply to special forces camp sites that were previously resupplied by paradrop.

## B. (U) OBJECTIVE 2 - AIRDROP TECHNIQUES

Aerial delivery of supplies in Vietnam was accomplished primarily in support of special forces. US Air Force C-123 and C-47 transport aircraft were allocated for this purpose. CV-28 aircraft were made available to special forces on a mission basis from the corps allocation of aircraft. The Caribou, used as opportune airlift to assist in reducing supply backlog, performed airlanded, gravity drop, paradrop, and LOLEX missions in support of isolated special forces camp strike force operations.

### 1. Gravity Drop

There were seven gravity drop missions performed during the evaluation period. These drops were primarily in support of construction activity. Sandbags, barbed wire, and barbed wire pickets were the predominant supplies delivered. Gravity drop was a rapid and economical method for delivering bulk supplies and, additionally, appreciably reduced turnaround time for the aircraft, since only one low pass over the drop zone (DZ) was required to deliver the cargo.

To reduce exposure time of the aircraft, a steep approach was made to a DZ. Flaps were used to slow the aircraft. The pass over the DZ was made at 90 knots and at an altitude of 20 to 50 feet. With roller conveyers installed in the Caribou, the palletized cargo was easily pushed from the aircraft. After the cargo had been dropped, maximum except for takeoff (METO) power was applied and a steep climb executed until the aircraft had reached 1,500 feet terrain clearance. Normal

climb power (35 inches of manifold pressure and 2,000 rpm) was then maintained until 2,500 feet clearance was reached.

Gravity drop was a standard drop technique with limited, but valuable, application in Vietnam. The rear loading ramp and installed roller conveyors made the CV-2B suitable for employing this delivery technique.

## 2. Paradrop

The majority of paradrop missions flown by the CV-2B in Vietnam were in support of isolated special forces camp sites and the long range strike force patrols composed of local recruits trained, equipped, and advised by US special forces.

There were 146 paradrop missions executed from 1 May to 31 October 1964 in which 654,576 pounds of supplies were delivered. The cargo dropped on each mission averaged 4,647 pounds. The S-4, 5th Special Forces Group, Vietnam estimated that approximately 10 percent of the airdropped supplies delivered by the CV-2B, C-123, and C-47 were either lost, damaged, or destroyed. His estimate was based on reports received from the field.

Resupply of strike force units on long range patrols in jungles and jungle-covered mountains presented a unique problem in Vietnam. Drop zones were too small to execute accurate drops. There were few clearings or level areas to permit delivery by LOLEX and gravity drop was not suitable for soft supplies. In many cases, the patrols could not be seen because of the jungle canopy even though communication by FM radio was possible (figure 15).

A technique for paradrop which had reasonable success was developed by the CV-2B crews and special forces "B" team attached to I Corps. Many times it was impossible to paradrop from the normal 400 foot altitude in the mountains because of the restrictive valleys, streams, and ridges selected as DZ's. The strike force was instructed to select DZ's that had open approaches. But because the jungle canopy restricted observation of surrounding terrain, experience showed that the strike force could seldom select an adequate DZ.

It was difficult to preplan the selection of DZ's for use on subsequent days because progress in the jungle could not be predicted accurately. However, it was attempted. The patrol at the pre-designated time attempted to gain radio contact with the approaching Caribou. If a stream bed or open ridge was used as the DZ, panels and smoke were used to mark it. If the jungle canopy prevented the use of panels, then only smoke was used. Upon sighting the smoke, the Caribou executed a dive, pulling up about 400 feet from the smoke and about 150 feet above the jungle. The crew chief released two bundles just as the





(U) FIGURE 15. Typical jungle drop zone.

aircraft pulled up to avoid the trees surrounding the DZ. Additional passes were made as necessary, adjusting the dive angle and release point according to information received from personnel on the ground. When dropping in mountainous areas, the standard technique of maintaining 400 feet terrain clearance many times caused the load to be released one to three thousand feet above the DZ. With the unpredictable winds in the mountains there was no assurance of accurate delivery. In some cases where the standard paradrop technique was used in dropping into restricted areas, the higher drop altitude caused large errors in delivery. This resulted in a high percentage of cargo that could not be located or recovered because of the terrain or enemy activity. Based on patrol reports, however, special forces "B" team at Da Nang estimated that 90 percent of the equipment was recovered when delivered by the dive technique. Evaluators who flew on such missions substantiated this estimate.

### 3. Low-Level Extraction (LOLEX)

Low-level extraction is a method of delivering supplies from a rear-loading aircraft flying five to eight feet above the ground, at about 70 knots indicated airspeed. The supplies, packed on pallets, are placed on two sets of rollers running the length of the aircraft cargo compartment. By means of an extraction chute, the cargo is pulled from the aircraft. The pallets contact the ground in a level attitude decelerating to a stop in about 90 feet. The system requires a reasonably cleared and level area 400 feet long for the extraction of one pallet containing 3,000 pounds of cargo. A double or tandem extraction (6,000 pounds) can be made within an area approximately 700 feet long. Three pallets, each with 2,000 pounds of cargo, can be extracted in an area 1,000 feet long. Open fields and roads are ideal for LOLEX.

Low-level extraction uses standard air items and expendable pallets. It is basically the heavy drop system used at higher altitudes, minus the large cargo parachute. A qualified US Army rigger, MOS 464, 748.2, or 461A7 is required to accompany the load as drop master, to load the aircraft, install the air delivery system, and prepare the load for flight ejection. A full description of the LOLEX technique as used in Vietnam is in annex D.

At the suggestion of ACTIV, special forces procured the air items necessary to employ the LOLEX technique in Vietnam. On 19 July 1964, the first LOLEX mission executed in an operational area was flown, delivering 6,300 pounds of equipment on 3 pallets to the special forces camp site at Phrey Shrunh. This camp had previously been resupplied entirely by paradrop.

There were 55 LOLEX missions executed from 19 July to 31 October 1964, which delivered 325,502 pounds of equipment and supplies. Each mission delivered an average of 5,166 pounds of cargo. Figure 16 shows

the relative cost of the LOLEX missions executed in Vietnam, and the cost of delivering the same amount by paradrop, using the CV-2B aircraft.

Delivery Method	Rigging Time	Cost of Air Items	Lost and Damaged Supplies	Time Over DZ
LOLEX	1 Hour 10 Minutes	\$160.00	5 Percent (Actual)	6 Minutes
Paradrop	5 Hours	\$1600.00	10 Percent (Estimated)*	20 Minutes

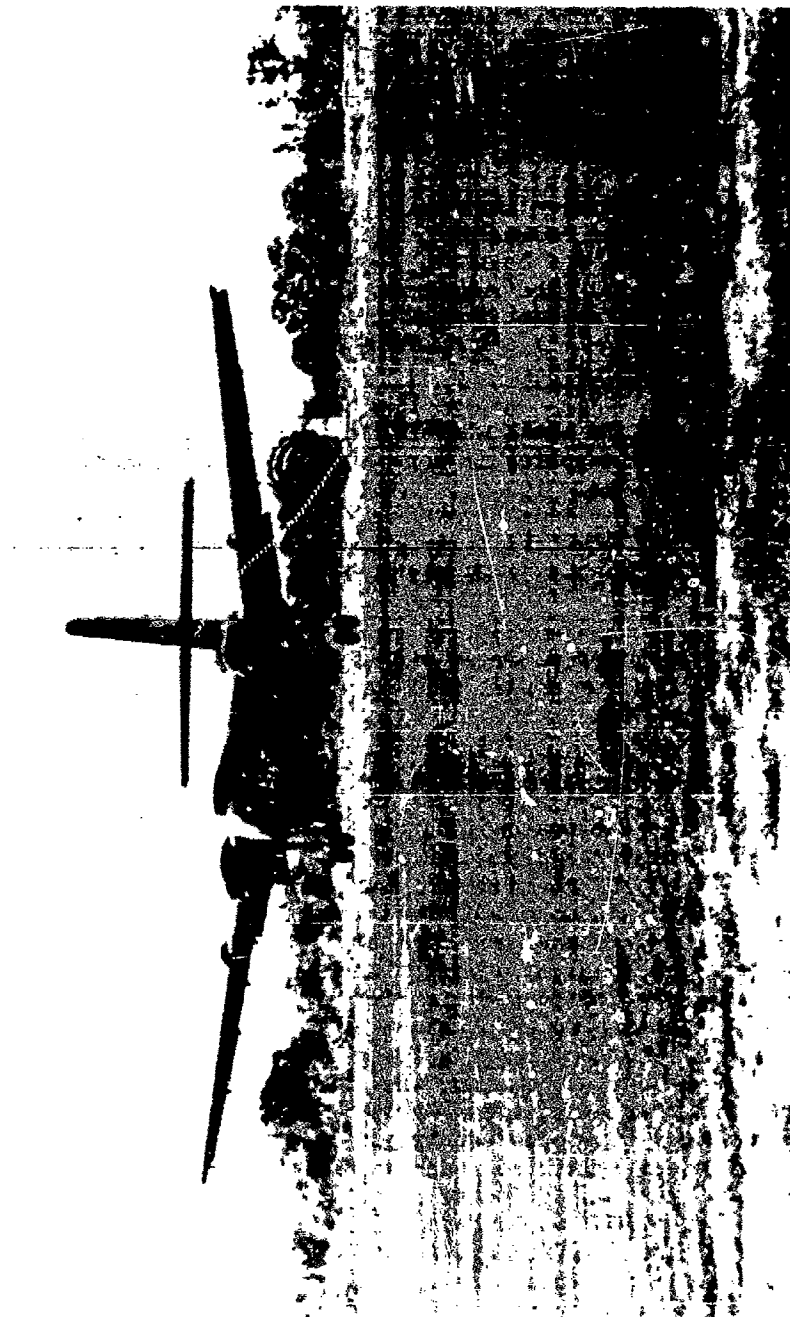
\* Estimated by S-4, Special Forces Group, Vietnam.

(U) FIGURE 16. LOLEX and paradrop comparison.

Recovery of LOLEX delivered supplies could be accomplished by hitching the clevis on the pallet to a vehicle and dragging the pallet off the DZ. Compared to paradrop, LOLEX reduced recovery time significantly, although comparative times were not recorded. The time required for paradrop recovery depended on the dispersion of the parachuted bundles.

Damaged, destroyed, and lost equipment from LOLEX was 5.3 percent. Special forces estimated a loss of 10 percent from paradrop, based on after-action reports submitted by the "A" teams that were supported.

On a typical LOLEX mission, the Caribou approached the DZ at an altitude of 2,500 feet above the terrain for protection against ground fire. A letdown was executed so that the airplane arrived over the field at 2,000 feet with an airspeed of 110 knots and in a position to execute a 180 or 270 degree approach. On downwind, the gear was extended, flaps set at 15 degrees and airspeed was reduced to 90 knots. On turn to base, airspeed was reduced gradually and flaps set at 25 degrees. On short final, power was adjusted to maintain level flight 5 to 8 feet above the drop zone at 70 to 80 knots. Over the release point, the copilot activated the pendulum release on command of the pilot. After the pallets were extracted, a normal go-around was executed, and cruising altitude attained as quickly as possible. The average time the aircraft was at a vulnerable altitude, below 2,500 feet, was 6 minutes. To drop twelve 500-pound bundles by parachute at special forces airfields took an average of 4 passes at 400 feet altitude and approximately 20 minutes. Low-level extraction reduced the time of exposure to enemy antiaircraft fire in the DZ by approximately 75 percent (see figure 17).



(U) FIGURE 17. LOLEX delivery.

All LOLEX missions were executed in support of special forces at locations that had been previously supplied by paradrop. There were special forces camp sites in the delta region that were located on small raised portions of land, completely surrounded by flooded rice paddies, with only a narrow road leading into the camp. Supplies were delivered on these using LOLEX techniques. Annex D contains the data on each LOLEX mission performed in Vietnam during the period of the evaluation.

There were two limitations in Vietnam that affected employment of LOLEX. The requirement for an open, relatively flat DZ precluded its use in jungle and mountain operations where there were very few DZ's of adequate size. The requirement for qualified rigger personnel trained in the LOLEX system limited its use to special forces.

#### 4. Conclusions

a. In areas where it can be used, the LOLEX method of aerial delivery of supplies is more efficient and economical than the paradrop technique.

b. Low-level extraction is the most accurate airdelivery technique used by the CV-2B aircraft in Vietnam.

c. The CV-2B STOL characteristics and LOLEX capability provided 5th Special Forces Group with flexibility in selecting the most effective method for aerial delivery of supplies to isolated camp sites and patrol bases.

#### C. (U) OBJECTIVE 3 - EVALUATION OF TOE

During the evaluation, the 61st Aviation Company operated under TOE 1-107T which was designed for a U-1A (Otter) company. Approved changes to TOE 1-107T provided additional mechanics, clerks, and communications personnel, and adjusted MOS's to properly support the CV-2B aircraft. The major personnel deficiencies noted in TOE 1-107T were a shortage of aircraft mechanics, aircraft technical inspectors, and maintenance supervisors. Equipment deficiencies noted were unreliable generators, inadequate lighting sets for night maintenance, and inadequate maintenance stands. The requirements for a TOE for an organization in RVN would not apply worldwide; however, the counterinsurgency environment in Vietnam can serve as a model for the type of operation that might be required in many under-developed countries where there are extremes in weather and terrain and a lack of roads and modern airfield facilities. The information and data collected during the evaluation have been adjusted and applied to TOE 1-59D, dated 27 March 1964, which was approved by Department of the Army for the Aviation Company (Airmobile - Fixed-Wing). Specific recommendations for augmentation and changes to the TOE are in annex E. An extract of TOE 1-59D appears as appendix 1, annex E.

## 1. Personnel

### a. Company Headquarters

The 61st Aviation Company was required to submit 33 recurring reports to higher headquarters. The frequency of these reports were: 4 daily, 5 weekly, 17 monthly, 5 quarterly, and 1 annually, for an average of 6.3 reports per day. There were many requests for special one-time reports and information. Awards and decorations and computation of combat pay were also continuing requirements. The company operated throughout Vietnam, which required that the company commander be away from the company frequently to supervise operations, coordinate with support units, and be present in the active areas. An executive officer is required to supervise administrative functions and to allow the company commander the freedom of movement that his duties require.

TOE 1-59D, paragraph O1, line O6, authorizes one airplane technical inspector, MOS 679.40, E-6.

During the 6-month evaluation the 61st Aviation Company flew an average of 1,069 hours per month. To support this monthly flying required an average of 11 periodic inspections, 22 intermediate inspections, and 200 daily inspections.

Maintenance data collected during the period revealed that approximately 600 man-hours per month were devoted to the technical inspection portion of scheduled inspections and demand maintenance.

The 600 man-hours per month did not include the other normal duties of the technical inspector, such as:

- 1) Maintaining the technical library, including all changes and modifications to be performed
- 2) Preparing and submitting technical maintenance reports
- 3) Maintaining an equipment improvement recommendations (EIR) file on EIR's submitted by the unit.

No attempt was made to establish the man-hours required to perform these duties. One technical inspector producing 195 man-hours per month could only accomplish something less than one-third of the work required. The remaining two-thirds of inspector duties were performed by platoon sergeants and maintenance supervisors. To provide adequate quality control and to release other maintenance personnel to perform their primary duty, two additional airplane technical inspectors, MOS 672.40, E-6, should be authorized.

b. Operations Section

TOE 1-59D authorizes one ground control approach (GCA) equipment repairman, MOS 282.2, for the maintenance of the GCA radar set AN/TPN-8. In addition to this radar set, the company is authorized one AN/APN-158 (WP-103) weather avoidance radar set and one AN/PX-44 transponder installed as auxiliary equipment on each of the 16 airplanes assigned. There is no maintenance capability for these sets within the company.

Two GCA equipment repairmen cross-trained on the AN/APN-158 weather avoidance radar and the AN/PX-44 transponder would provide the company with sufficient organizational maintenance capability in the operations area.

c. Airplane Sections

(1) Flight Platoon Aviators

With 9 or 10 aircraft committed each day, the flight platoon aviators were required to fly 2 consecutive days with the third off for rest and the performance of additional duties. Since the average flying day is 12 hours, crew rest takes on an added significance in Vietnam. During the 12 hours, an average of 2 missions were flown with 10 landings. An average of four landings were made into strips that required maximum performance from both the crew and aircraft. Enemy anti-aircraft fire was received on the average of twice each week. During the monsoon season in the delta region, an average day might consist of 30 minutes of actual instrument flying at low altitude flown under conditions that would be considered uncontrolled by CONUS standards. A typical 12-hour flying day is indicated below:

Briefing and flight planning	1 hour
Preflight	$\frac{1}{2}$ hour
Flight time	5 hours
Ground time in cockpit	2 hours
Lunch break	1 hour
Ground time and supervising loading and unloading	2 hours
Inspection of aircraft for ground fire damage	$\frac{1}{2}$ hour
Total	12 hours

The average monthly flying time for aviators of the 61st Aviation Company is shown in figure 18. Total flying time was well within limits recommended by AR 95-17. However, conditions under which they were flown, coupled with an average duty week of 70 hours, must be taken into consideration. TOE 1-59D, paragraphs 03 and 04, provide sufficient aviators to support 1200 flying hours per month and still provide adequate crew rest.

## (2) Airplane Section Chief

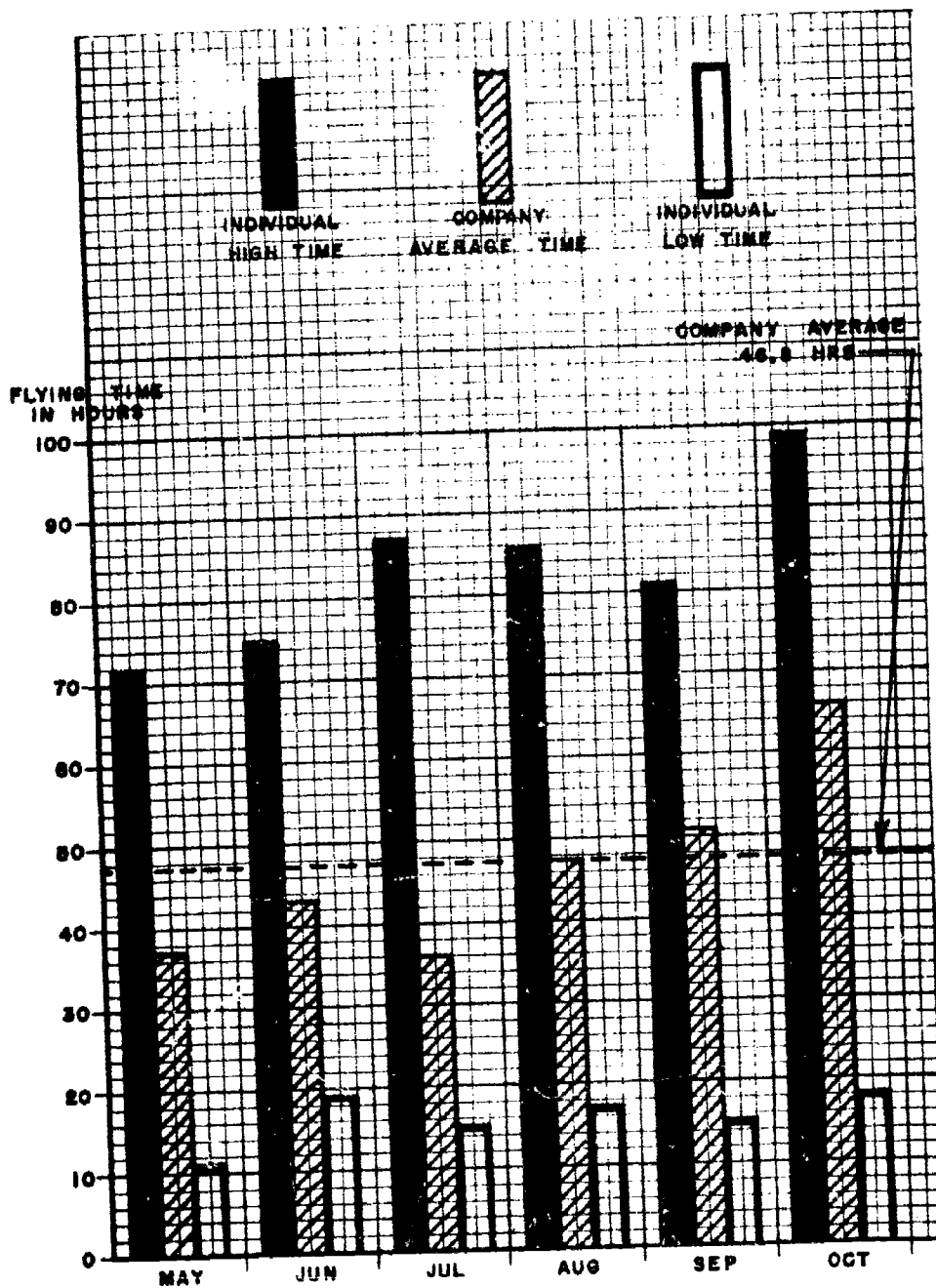
Each airplane section operates in Vietnam with four flight engineers and four assistants. With a shortage of maintenance supervisors, it was not always possible to assign a section chief to each airplane section; however, an experienced maintenance man, whose primary duty was flight engineer, was designated the section chief and provided the required supervision of personnel and the daily and intermediate inspections.

With aircraft stationed in isolated areas away from maintenance facilities, it was essential that maintenance discrepancies be detected early and corrected before they developed into a grounding condition. One Staff Sergeant (E-6), MOS 672.6, was required to perform the duties of airplane section chief. Since the section chiefs were seldom available, the duties of the section chief had to be performed by the most senior experienced flight engineer.

## (3) Assistant Flight Engineer

The 61st Aviation Company provided service to airfields and strips that in most cases did not have facilities for loading, unloading, and manifesting of passengers and cargo. These functions were performed by the US advisory personnel to RVN units that were located at the strips. These isolated advisory teams were serviced by a scheduled courier flight in II, III, and IV Corps. To remain on schedule it was necessary that ground time be reduced to a minimum. It was also essential that the flight engineer perform a thorough inspection of the aircraft for ground fire damage after each flight. To meet these requirements, an assistant flight engineer was placed on all CV-28's operating in Vietnam. Specifically, he directly supervised the loading and unloading of cargo and passengers, secured the load, and signed for mail, cargo, and other accountable items. He assisted in the servicing of the aircraft after each landing. The assistant flight engineer performed valuable service by aiding the flight engineer in correcting maintenance discrepancies that occurred while the aircraft was away from maintenance facilities. For example, it requires two men to remove an engine cowl. When correcting a maintenance discrepancy in the vicinity of the engine and when no maintenance stand was available, the assistant was invaluable. Assistant flight engineers were provided from company resources. These personnel were selected from all sections of the company.





(U) FIGURE 18. Aviator flying time per month.

The primary justification for an assistant flight engineer was the handling of passengers and cargo so that the flight engineer would be free to inspect and maintain the aircraft at each stop.

d. Service Platoon Headquarters

The 61st Aviation Company found it necessary to have a WO assistant maintenance officer, although one was not authorized by the TOE. Even though the service platoon contains 50 percent of the enlisted personnel of the company and all of the trained specialists, it is authorized only 10 percent of the officer supervisory personnel.

It was necessary to have a day and night shift for aircraft maintenance. It was also necessary to dispatch maintenance crews to outlying airfields to perform demand maintenance. Test flying was a continuing requirement. To provide adequate supervision under these circumstances, an assistant maintenance officer was essential and was appointed from company resources.

e. Maintenance Sections

The 61st Aviation Company was unable to perform the required organizational maintenance to support an average monthly flying hour program of 1,069 hours. The 611th Direct Support Company and the 330th General Support Company, along with the attached 326th Maintenance Detachment, had to provide organizational maintenance support with the result that organic third and fourth echelon capabilities were reduced. Additional aircraft mechanics are required in the service platoon to correct this situation.

Based on six months of statistics taken from maintenance and operational records of the 61st Aviation Company and supporting units, it was determined that 9,899 organizational maintenance man-hours were required per month to support a 1,069 monthly flying hour program at a 67 percent aircraft availability rate. Flight engineers and assistants were normally on flying duty for two consecutive days. The third day was for crew rest or was spent performing daily or intermediate inspections. It must be emphasized that flight engineers and assistants were away from home station with the aircraft on an average of 11 hours a day when performing flight duty. Daily and intermediate inspections performed by the flight engineers accounted for 1,607 man-hours per month. The 16 flight engineers and 16 assistants were not available for other organizational maintenance. In considering maintenance hours available, only those aircraft mechanics and electricians of the service platoon who performed the demand maintenance and periodic inspections were considered. Demand maintenance and periodic inspections accounted for 8,291 man-hours a month.

The service platoon TOE 1-59D made available 6,630 man-hours. Productive man-hours per man per month in Vietnam were computed as follows:

Man-hours per man-week	60.00
Man-weeks per month	<u>x 4.33</u>
Total man-hours per month	260.00
 Total man-hours per month	 260.00
Constant factor for productive work (Taken from SB 1-2)	<u>x 0.75</u>
Total productive hours per man per month	195.00

Man-hours available in the service platoon were computed as follows:

<u>Designation</u>	<u>MOS</u>	<u>Number</u>
Aircraft mechanic	672.30	24
Aircraft mechanic helper	670.00	8
Elec equipment repairman	284.10	<u>2</u>
	Personnel available	34
Productive man-hours per man-month		195
Personnel available		<u>x 34</u>
Total productive man-hours available		6,630

There was a deficit of 1,662 man-hours per month in the service platoon, computed as follows:

Total organizational maintenance man-hours required	9,899
Less daily and intermediate inspection	- <u>1,607</u>
Man-hours requirement for service platoon	8,292
Man-hours available	- <u>6,630</u>
Man-hour deficit	1,662

To enable the Caribou company to perform all of its organizational maintenance and to redirect the field maintenance effort, the

TOE should be augmented by eight aircraft mechanics. Augmentation was computed by dividing one man-month of 195 hours into maintenance deficit of 1,662 man-hours.

## 2. Equipment

Although much of the TOE equipment has not been used in Vietnam because of the static situation that has existed, it cannot be stated that it will never be used. Should the counterinsurgency operations escalate into a limited or conventional war, the circumstances under which the company has operated could change drastically. Therefore, equipment changes are recommended only where the equipment is deemed unsatisfactory regardless of environment.

### a. Operations Section

Trailer-mounted generator set PU-294/G should be replaced by trailer-mounted generator set PU-253/U. The generator is provided to power the AN/TPN-8 GCA radar within the operation section. The GCA radar requires a source that will produce 110/207 volt, 400-cycle, 3-phase, 10-kw power. Generator PU-253/U meets the power requirement. PU-294/G is a 110/200 volt, 60-cycle, 5-kw generator.

Radio-teletypewriter set AN/GRC-46 should be replaced with radio-teletypewriter set AN/MRC-95. This would give the operations section the means for HF single-side-band voice communications with all aircraft that are equipped with the AN/ARC-102 HF single-side-band radios.

The AN/TRC-42 VHF radio set should be provided in the operations section for any aviation company employed in an overseas theatre. VHF is the standard air-to-ground communications for air traffic control worldwide. Inclusion of the VHF radio in the operations section would allow the air traffic control facilities of the company to be fully integrated with, and complement, the existing civilian facilities. The VHF radio would also provide the company with an alternate air-to-ground communications link with organic aircraft.

### b. Service Platoon

The tool set, organizational maintenance, Army aircraft set C, is set up with a tool density in increments of three and does not provide sufficient tools for the four aircraft maintenance sections.

In addition, set C does not contain floodlights essential for night maintenance. An organization maintenance tool set should be designed specifically for the CV-2B aircraft. It should eliminate unnecessary tools found in the standard sets and include any special tools designed specifically for the CV-2B.

One such tool set is now undergoing tests with the 11th Air Assault Division. If adopted, it should replace set C now authorized. As an interim measure, the C set could be replaced by two each tool sets, organizational maintenance, Army aircraft, set A and set B; and one shop set, ground handling and servicing, field maintenance, Army aircraft, set A. This combination of tool sets gives sufficient tool density and provides floodlights for night maintenance.

c. Special Equipment

(1) Engine Maintenance Stand

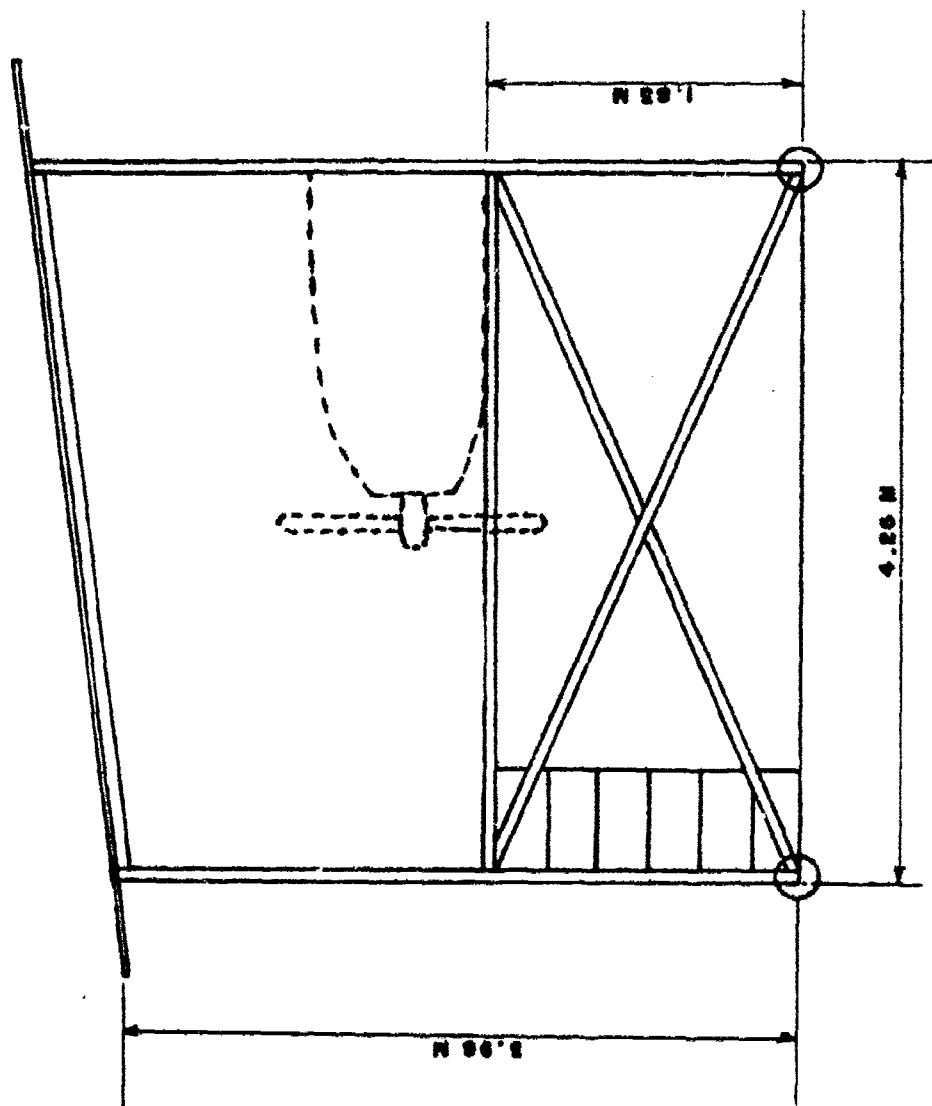
The performance of periodic and intermediate inspections, engine repair, and sheet metal repair were hampered by inadequate maintenance stands. With the standard maintenance stand (figure 19), it was necessary to use two stands to work on one engine and mechanics wasted valuable time dismounting from one and mounting the other. Dropped tools generally bounced off the stand, resulting in more wasted time to recover them. The metal floor of the standard maintenance stand was often wet and slippery during the monsoon season and created a safety hazard. A maintenance stand for the engine section of the CV-2B should be U-shaped, have a safety railing, a skid-proof floor that protrudes three inches beyond the railing, and should allow for the installation of a detachable top for protection from sun and rain. The detachable top should be able to withstand winds up to 25 knots. During conditions of higher wind velocity, little maintenance is performed outside. Retractable wheels, similar to the ground handling wheels for the UH-1B helicopter, would permit towing. Figures 20 and 21 show a type of U-shaped maintenance stand that would fulfill this requirement.

(2) Hoist

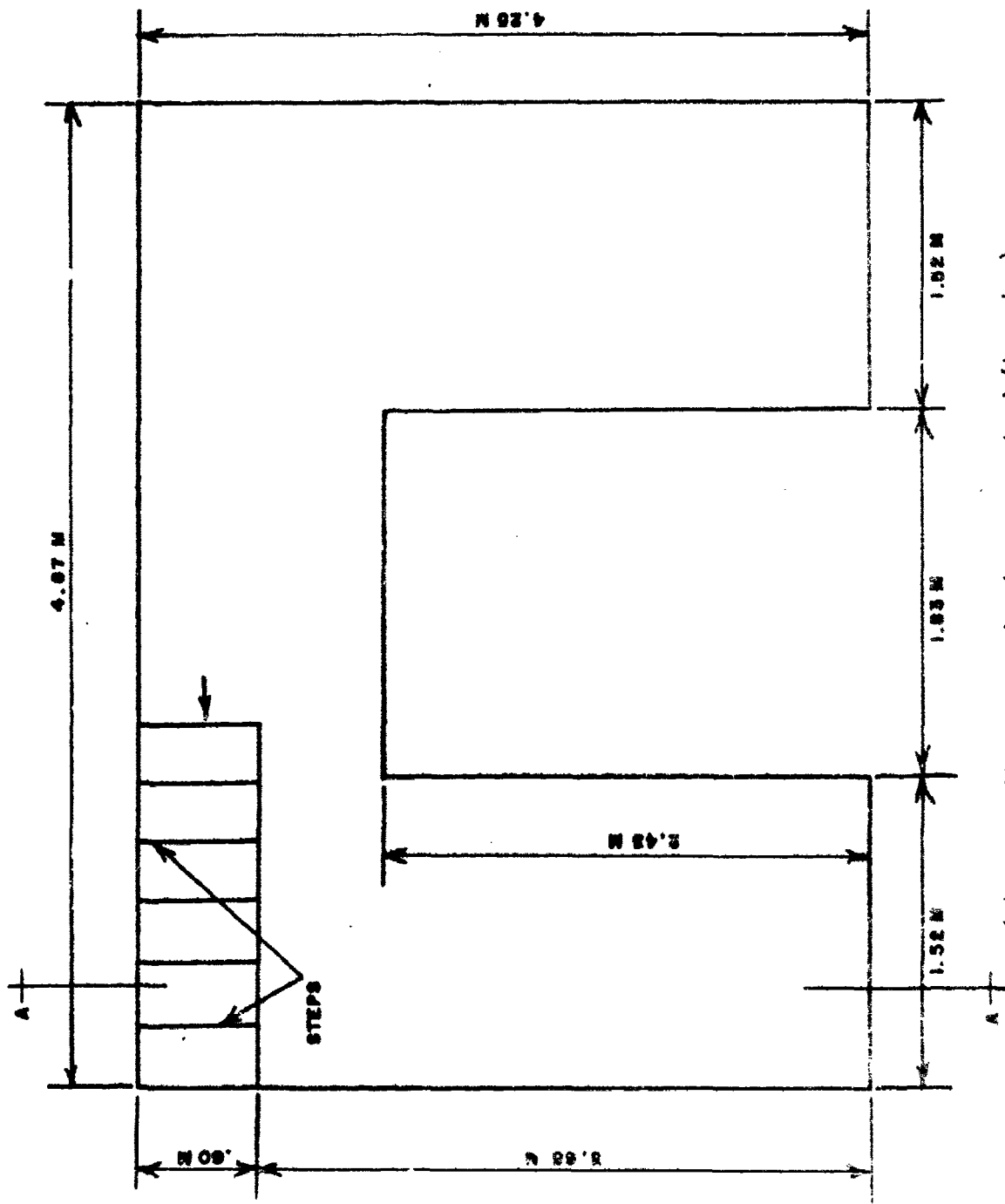
A thorough inspection and maintenance of the vertical stabilizer, rudder, horizontal stabilizer, and elevators was practically impossible using the hoist in the shop set C. Inspections were made by jacking up the nose wheel as far as possible thereby lowering the tail. By using the hydraulic stand, the inspector was able to make a partial visual inspection. However, the stand was too low to permit a thorough inspection. In order to lubricate the piano hinges of the elevator trim tabs, a mechanic had to walk on the horizontal stabilizer. He climbed up the hoist from the C set to lubricate the rudder trim and to change the anticollision light. A fall from this height could be fatal. Figure 22 shows the hoist used by the 61st Aviation Company. Figure 23 shows the Abbey hoist, manufactured by the Abbey Corporation in Australia and used by the Royal Australian Air Force in Vietnam. The Abbey device is battery-powered, hydraulically-activated, trailer-mounted and air-transportable by C-130 aircraft. The batteries are rechargeable. The lift capacity is 600 pounds. The Abbey device allows inspection and maintenance of the entire tail section. It is controlled by the mechanic on the work platform.



(U) FIGURE 19. Standard maintenance stands.

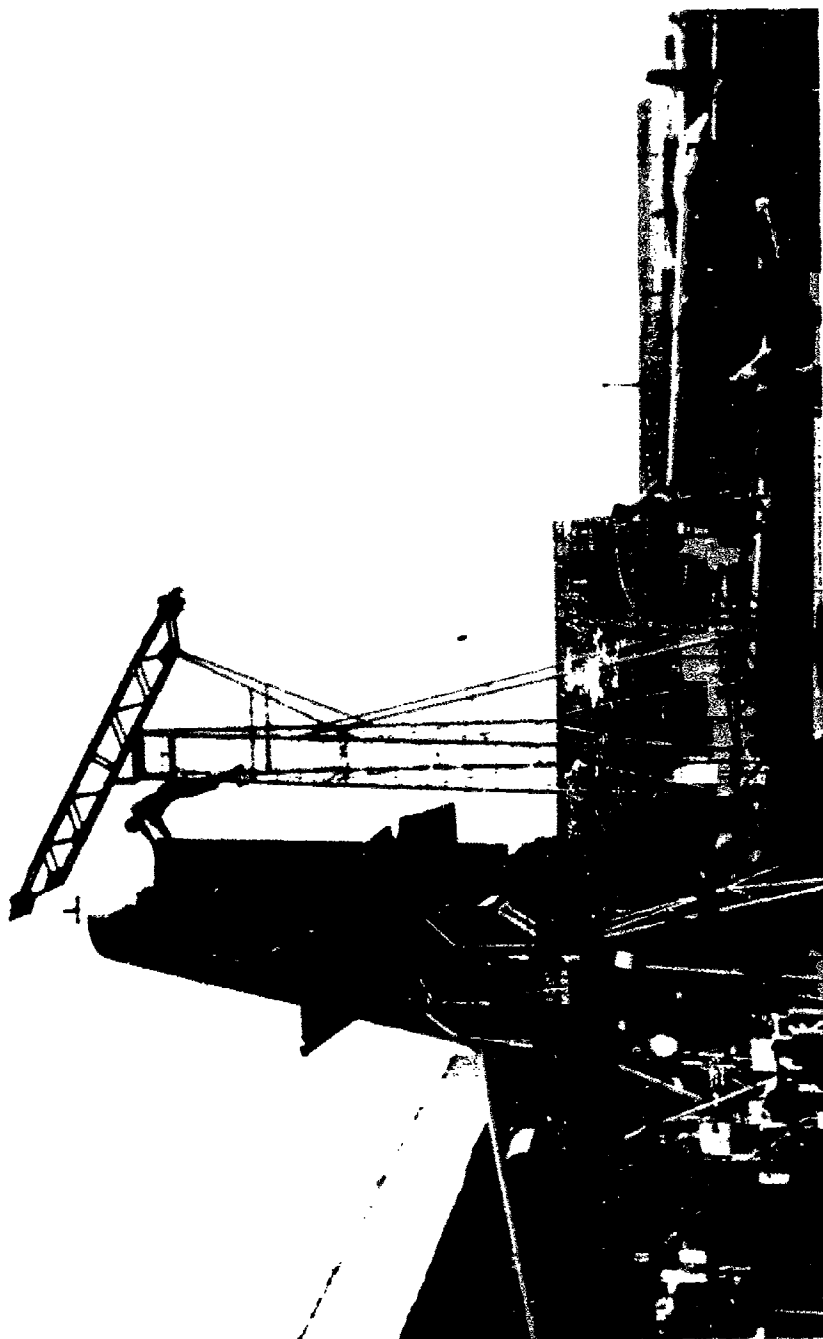


(U) FIGURE 20. Proposed maintenance stand (side view).

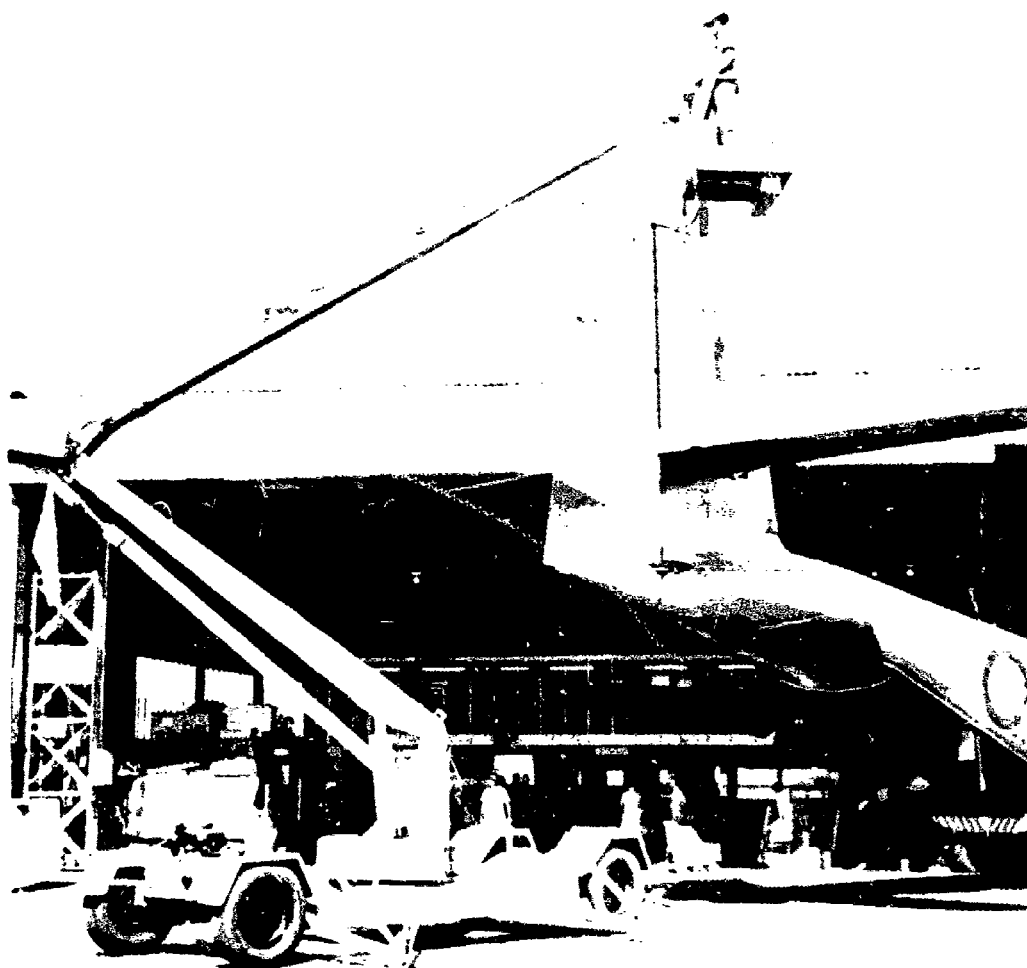


(U) FIGURE 21. Proposed maintenance stand (top view).





(U) FIGURE 22. Standard maintenance hoist.



(U) FIGURE 23. Abbey hydraulic hoist.

The Australian Air Force has on order another device which will not only perform the above functions, but additionally can tow aircraft, lift an engine and propeller assembly, load and unload aircraft, and provide a general purpose stand. This device, a Hyster Fork Truck, manufactured by the Hyster Corporation in Australia, costs approximately \$36,000. Both Abbey and Hyster are American corporations with plants in Australia. Either of these devices would meet the stated requirements for a safe and efficient hoist.

#### 4. Conclusions

a. TOE 1-59D, dated 27 March 1964, Aviation Company (Airmobile - Fixed Wing) does not provide adequate command, control, and maintenance personnel and equipment for counterinsurgency operations.

b. Since the aviation company (airmobile -- fixed wing) has the capability to establish and operate a company airfield, the AN/TRC-42 VHF radio should be included in the equipment for the operations section. This would permit the company to tie in with existing civilian air traffic control facilities.

c. A maintenance stand designed specifically for the engine section of the CV-2B would expedite daily, intermediate, and periodic inspections and demand maintenance.

d. A hoist platform similar to the Abbey or Hyster device provided at each airfield where CV-2B maintenance is performed would expedite maintenance on the tail section and eliminate a serious safety hazard.

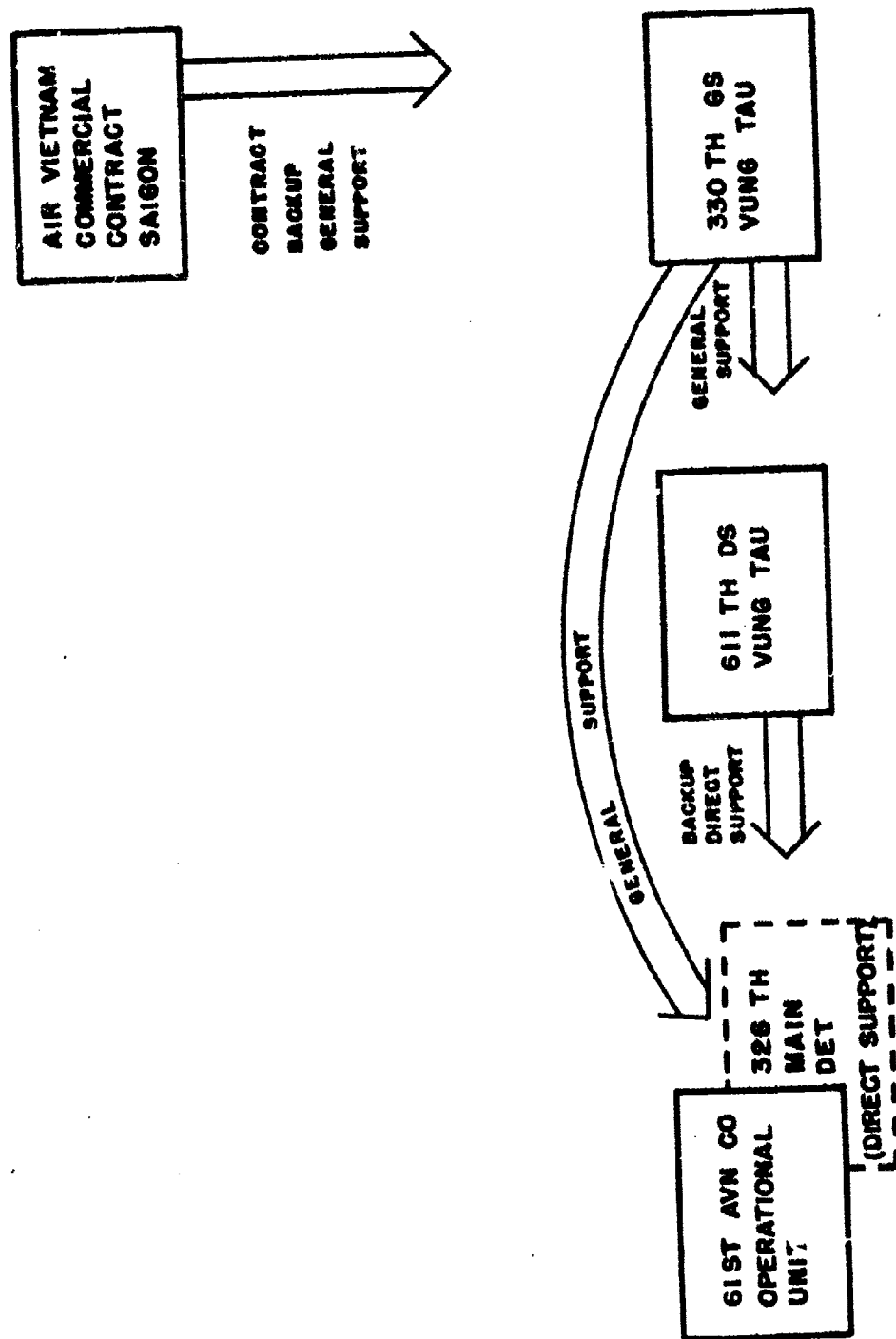
#### D. (U) OBJECTIVE 4 - LOGISTICS

The 61st Aviation Company was located adjacent to the 611th Direct Support Maintenance Company (DS) and the 330th General Support Company (GS) at Vung Tau. The advantage of being next door to maintenance backup and aircraft supply was exploited to the fullest. With the aircraft maintenance facilities co-located, time expended in processing work orders and requisitions was reduced to a minimum.

#### 1. Aircraft Maintenance

##### a. Organization

The organic maintenance personnel of the Caribou company performed first and second echelon maintenance, and the attached 326th Maintenance Detachment performed third echelon maintenance. The 326th Maintenance Detachment and the 61st Aviation Company maintained separate maintenance facilities. Work orders were submitted for all maintenance requests. Figure 24 shows the maintenance flow. The service



(U) FIGURE 24. Maintenance flow.

platoon leader of the 61st Aviation Company was the unit maintenance officer, but did not exercise any control over the attached maintenance detachment. Work orders were used to request maintenance and supply actions.

For maximum effectiveness, aircraft maintenance must be programmed. During peacetime conditions this does not present a problem. In Vietnam the operational requirements dictated by the tactical situation were the major factors influencing the hours flown and when they were flown. The company commander had the authority to switch aircraft as he desired; however, this did not prevent a maintenance backlog from developing because all available aircraft were flown each day. At times there were aircraft down for a periodic inspection with no maintenance crew available to perform the work. To keep the maximum number of aircraft flyable, the DS and GS companies accepted Caribou for periodic inspection, although this is a unit function. All maintenance units, irrespective of echelon, worked together to reduce the backlog.

Programming and coordinating maintenance to support tactical operations presented a continuous challenge to the unit maintenance officer. Operational considerations often took precedence over maintenance and a temporary backlog was the result.

#### b. Float Aircraft

During the first three months of the evaluation there were seven float CV-2B's in Vietnam. Of these seven, five had extensive crash damage. Two of the crash-damaged aircraft were placed on commercial contract with Air Vietnam for repair. One was delivered to Air Vietnam in May 1963 and returned 14 months and approximately 12,000 man-hours later. The other was delivered to Air Vietnam in November 1963 and was completed 11 months and approximately 12,965 man-hours later. Thirteen months were required by the 611th DS Company to return a third crash-damaged aircraft to service.

The 330th General Support Company was repairing the remaining two damaged aircraft as of 31 October 1964. One had been down approximately one year; the other six months. Crash-damaged aircraft requiring extensive repair reduced the number of effective float aircraft by 70 percent during the first half of the evaluation period. Three new float aircraft arrived in RVN in August 1964, which raised the number of flyable float aircraft to five. The five aircraft that were provided for the out-of-country classified assignment were dropped from the 61st Aviation Company property book on 2 September 1964 and four of the float aircraft were assigned to the company for in-country support, temporarily reducing the number of flyable floats in-country to one.

### c. Aircraft Availability

Figure 25 shows the aircraft availability rate by month for the period of this evaluation.

Figure 26 shows the average number of aircraft available each day and the number actually used. All available CV-2B's were flown every day during the 6-month evaluation period, with the exception of the few days when weather prevented flight.

Operational requirements did not permit holding down aircraft for maintenance. Each aircraft was inspected after each day's operations, and maintenance was performed nightly to prepare the aircraft for the next day. All maintenance, except that which was absolutely essential, was deferred to the next periodic inspection.

### d. Scheduled Inspections

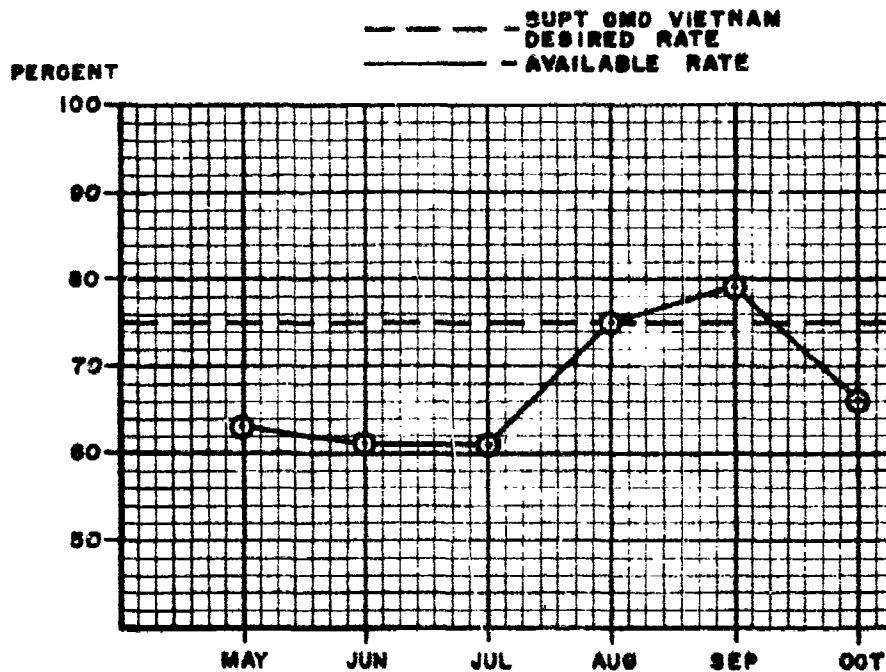
There were 77 normal periodic inspections (PE) performed during the 6-month evaluation period. Figure 27 shows the number of man-hours by echelon for a normal periodic inspection. The inset in figure 27 shows the average man-hours expended on each PE per month. (The tenth PE, a major inspection, is not included.) A normal PE averaged 546.8 man-hours and 11.4 days for completion. A shortage of aircraft mechanics, MOS 672.3, was the primary delaying factor.

A tenth periodic inspection averaged a total of 2,392.5 man-hours. More significantly, the downtime for a tenth PE averaged 28.7 days. There were 6 tenth periodic inspections completed during the evaluation period. There was a noticeable reduction in downtime for the tenth PE toward the end of the evaluation period. The first 3 tenth PE's averaged 40.6 days downtime; the last 3 averaged 16.3 days. This was a result of the reduction in the maintenance backlog.

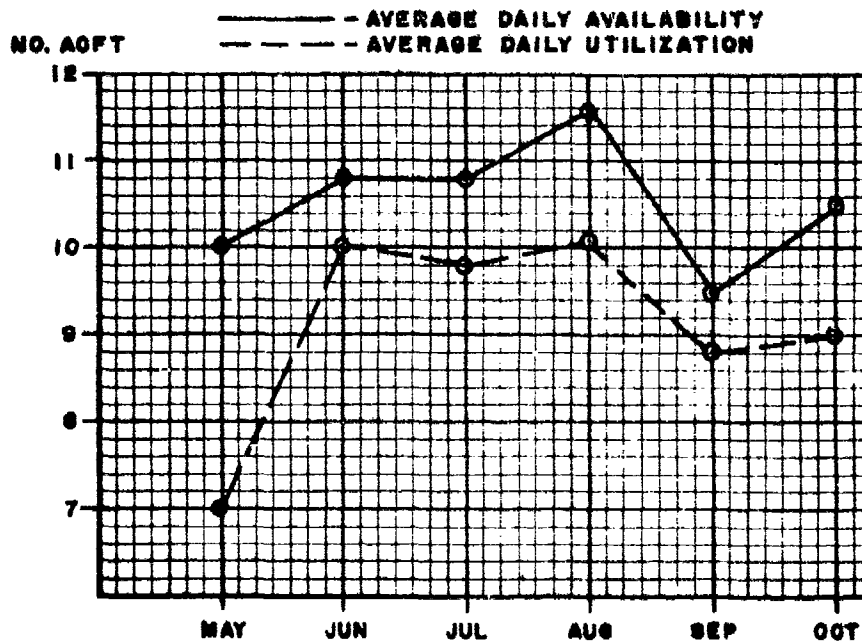
Intermediate inspections after every 50 flying hours required approximately 100 man-hours. The aircraft were down for an average of 1½ days.

Daily inspections required three hours. However, a maintenance team met each aircraft on its return from the day's operation and performed all of the maintenance necessary to place the aircraft in a flyable status for the next day.

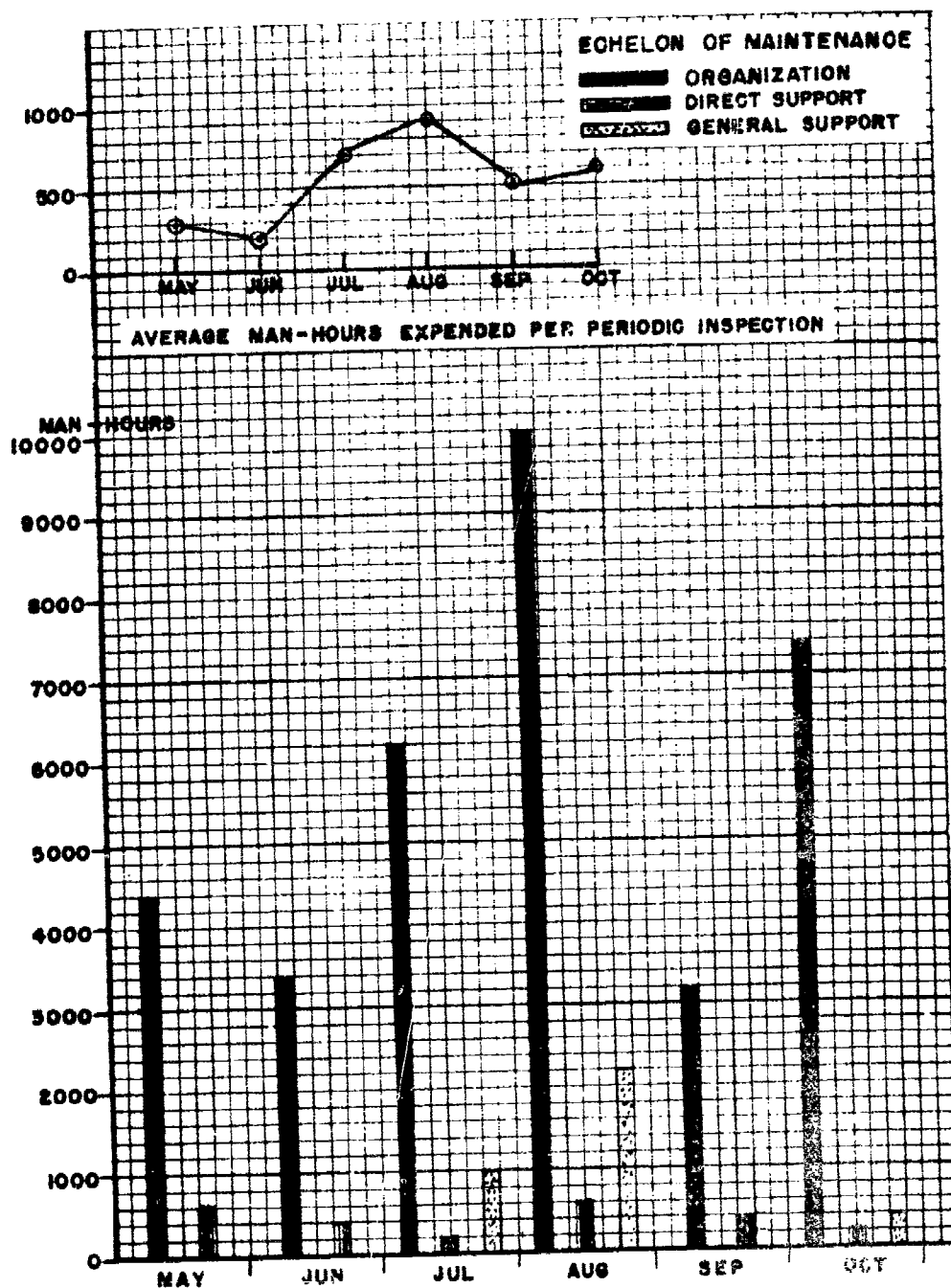
Deficiencies that were not a grounding condition were deferred until the next periodic inspection. However, demand maintenance constituted 34.5 percent of the total man-hours expended on organizational maintenance. Figure 28 shows demand maintenance performed by the organizations during the evaluation. The drop in man-hours expended in demand maintenance in October 1964 was caused by



(U) FIGURE 25. CV-2B availability rate by month.

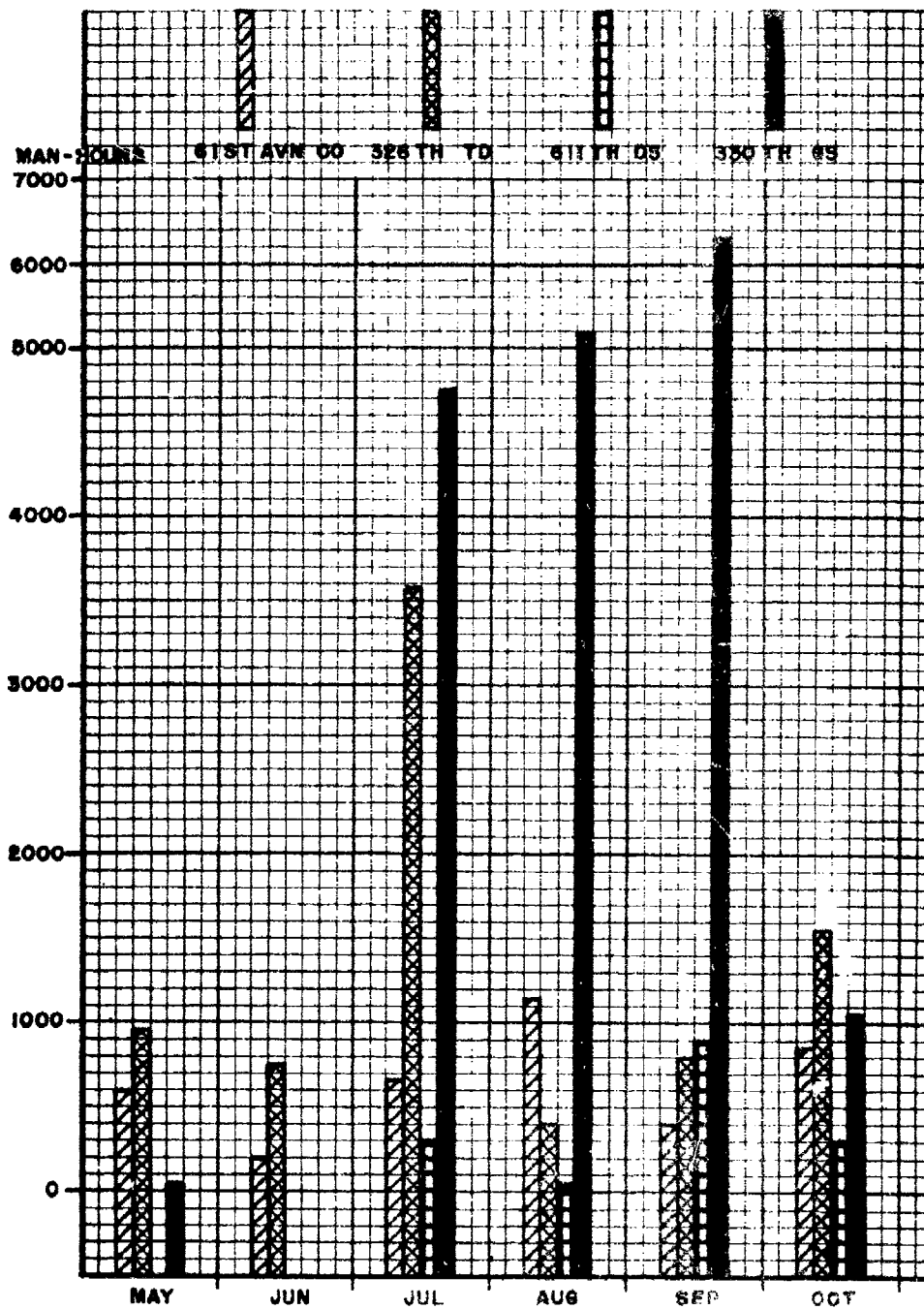


(U) FIGURE 26. Average daily CV-2B availability and utilization.



(U) FIGURE 27. Man-hours expended by echelon for normal periodic inspections.





(U) FIGURE 28. Man-hours expended by unit on demand maintenance.

the augmentation of civilian maintenance personnel which reduced the maintenance backlog that had accumulated until September 1964.

e. Crash Damage

To place crash-damaged aircraft into service, the commanding officer of the 765th Transportation Battalion requested a team of civilian sheet metal and aircraft repairmen to augment the 330th GS Company for a period of 90 days. This team of 12 sheet metal men expended 3,448 man-hours during the 90 day period in returning two Caribou to service. Two of the civilians voluntarily extended 30 additional days and three for an additional 60 days.

f. Battle Damage

Damage sustained as a result of enemy ground fire placed an insignificant work load on the sheet metal repairmen of the 326th Maintenance Detachment. Figure 29 shows the number of man-hours expended on repair of battle-damaged Caribou.

g. Reversible Pitch Propeller Modification

The reversible pitch propeller modification was accomplished on all 61st Aviation Company aircraft from 20 June to 8 October 1964. A team of 14 civilian technicians from De Havilland Corporation, and 4 from Hamilton Standard arrived in Vung Tau on the 20th of June to perform this modification. The installations were for the most part completed during a periodic inspection. However, three aircraft were held down specifically for the modification. Downtime averaged 18.2 days with an average of 958.4 man-hours expended for each modification.

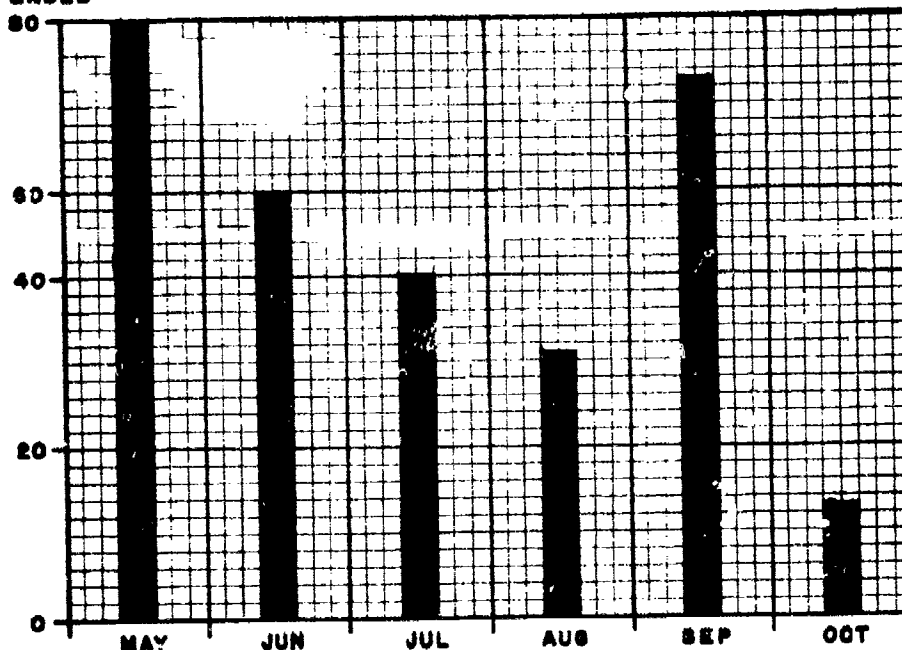
h. Engine Replacement

From 1 May to 31 October 1964, 25 R-2000-7M2 Pratt and Whitney airplane engines were replaced. The rated life for the R-2000-7M2 engine is 1500 hours. Records available on 14 engines indicated that the average life of the engines in Vietnam was 583 hours or 32 percent of the rated life. Extensive oil consumption and defective impeller seals were the most common cause for the engine changes.

2. Other Maintenance

Backup maintenance for all equipment, less aircraft, was located at Tan Son Nhut Airport near Saigon. Equipment for repair was shipped by air to the supporting maintenance shop. If extensive repair was required, the item was further evacuated to Okinawa by surface or air transportation. The static situation under which the 61st Aviation Company operated presented little opportunity to use much of the organic equipment under field conditions. The few vehicles and

**MAN-HOURS  
EXPENDED**



(U) FIGURE 29. Man-hours expended on battle-damaged Caribou.

generators that were down for parts or maintenance for an extended period had no effect on the ability of the unit to perform its mission. One bonus of this static situation was that assigned vehicle drivers, many of whom were also qualified aircraft mechanics, were not habitually required for vehicle maintenance and were thus available for aircraft maintenance. The majority of the TOE equipment was, in effect, in temporary storage, which required only that it be exercised periodically and that scheduled maintenance be performed.

### 3. Supply

#### a. Aircraft

The technical supply function of the 61st Aviation Company was performed by the attached 326th Transportation Detachment. Requisitions for supplies were prepared by the 61st Aviation Company on DA Form 979, Parts Request, which was authenticated by the company maintenance officer and hand-carried to the technical supply of the 326th located in the adjacent hangar. If parts were not in stock at the 326th, then the 326th prepared a DA Form 1546, Parts Requisition, which was hand-carried to technical supply in the direct support unit (DSU) of the 611th Direct Support Company. Parts were issued immediately if available. Total time to complete a supply action from the 61st Aviation Company through the 326th to the DSU averaged approximately one hour.

If a part was not available at the DSU, the requisition was mailed to the Army Consolidated Supply Point (ACSP) at Tan Son Nhut Airport. Requisitions not filled at the ACSP were teletyped to the Consolidated Supply Point, United States Army, Pacific, located on Okinawa. From there the requisitions not filled were electronically transmitted to the Inventory Control Point in Hawaii where they were either filled out of USARPAC stock or further transmitted to the National Inventory Control Point in St. Louis. Figure 30 shows the requisition channels.

During the evaluation there were 215 code 02, equipment down for parts (EDP) requisitions submitted. Aircraft downtime as a result of EDP's is shown in figure 31. This information was extracted from DA Forms 1352 submitted by the 61st Aviation Company. Figure 32 shows the number of EDP's by month and average fill-time during the evaluation. The average fill-time was 5.5 days. Transfer of parts between aircraft was a common practice by both the 61st Aviation Company and their backup maintenance units. The urgency of the tactical situation and the continuing demand for the maximum number of CV-2B's dictated this practice.

Requisition experience for code 05 (anticipated EDP), code 12 (normal replacement of special equipment), and code 17 (requisition for normal stockage replacement) is shown in figures 33, 34, and 35, respectively.

#### b. Other Supply

The 61st Aviation Company was the carrier unit for four small detachments located in Vung Tau, maintained their property books, and initiated requisition action. Although there were delays in receiving EDP's for vehicles, there was no effect on the mission accomplishment.

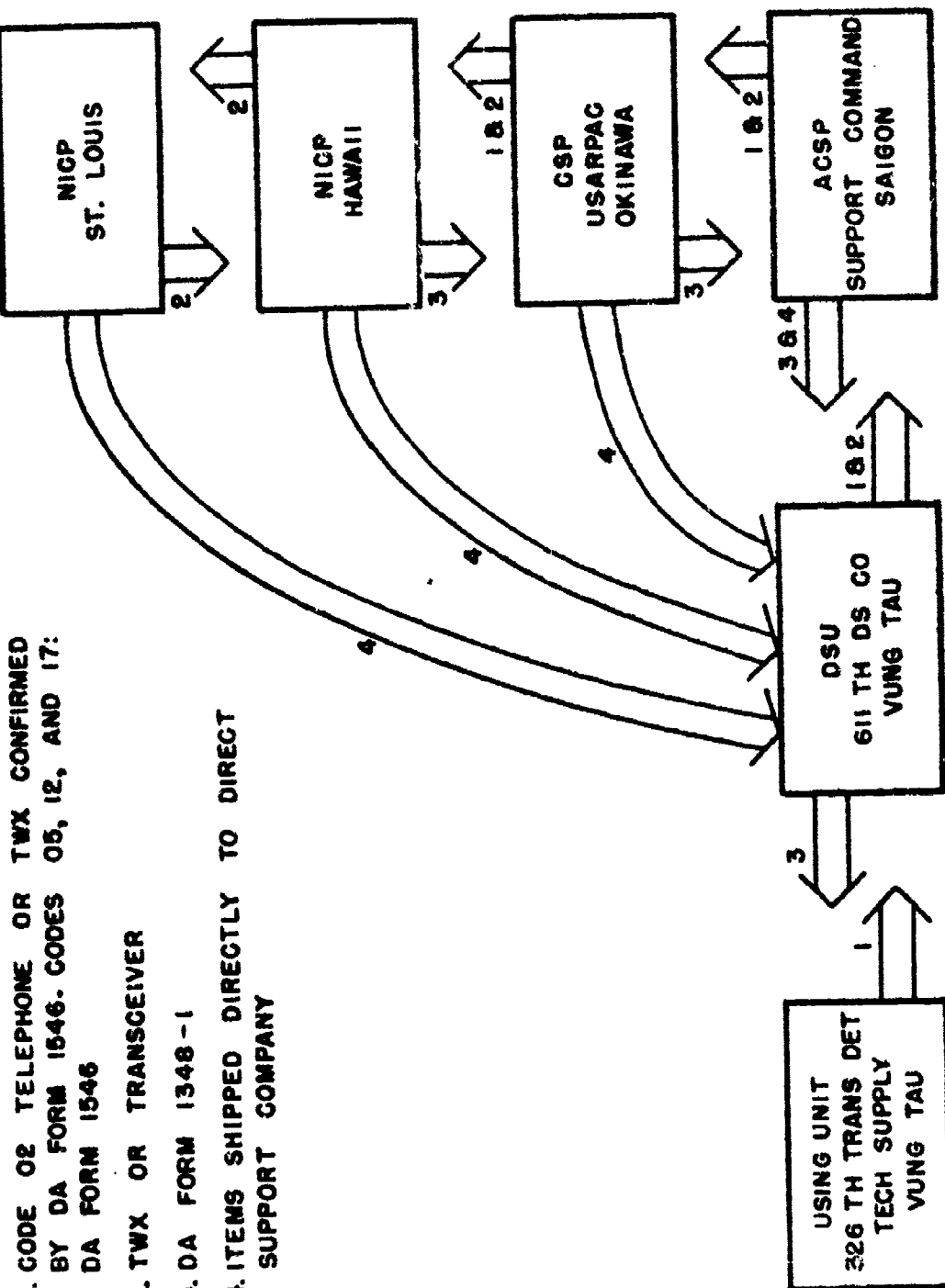
#### 4. Petroleum, Oil, and Lubricants (POL)

POL products and dispensing facilities were available throughout Vietnam at 52 airfields. It was possible, with the range of the CV-2B, always to plan for refueling at an airfield that had adequate facilities.

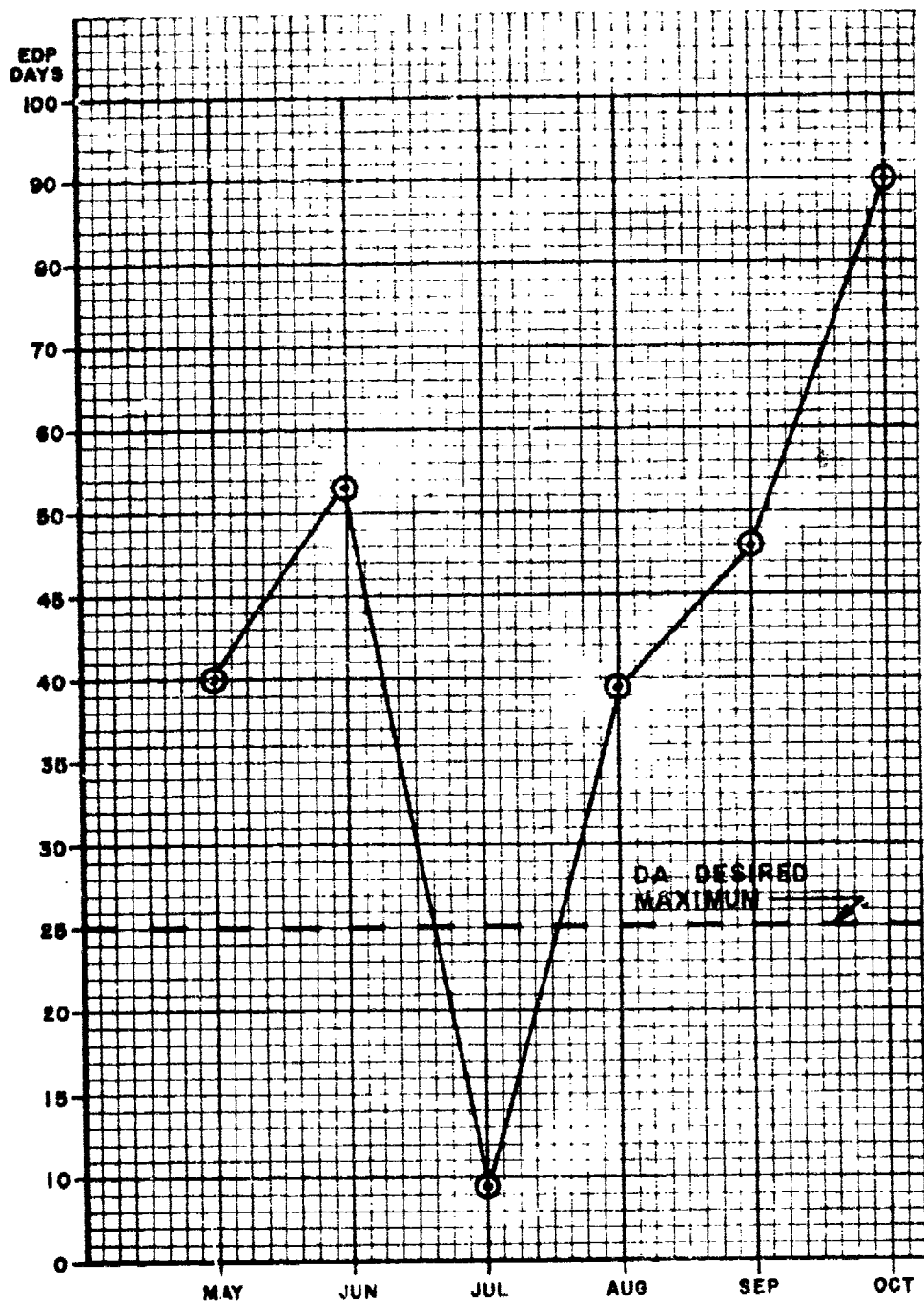
POL was supplied to all airfields by Vietnamese civilian contractors. The civilian tankers were able to move freely throughout Vietnam without serious interference from the Viet Cong. Military vehicles did not have this freedom of movement. If the Viet Cong were to stop the movement of civilian tankers, a serious POL resupply problem would result in Vietnam.

#### 5. Facilities

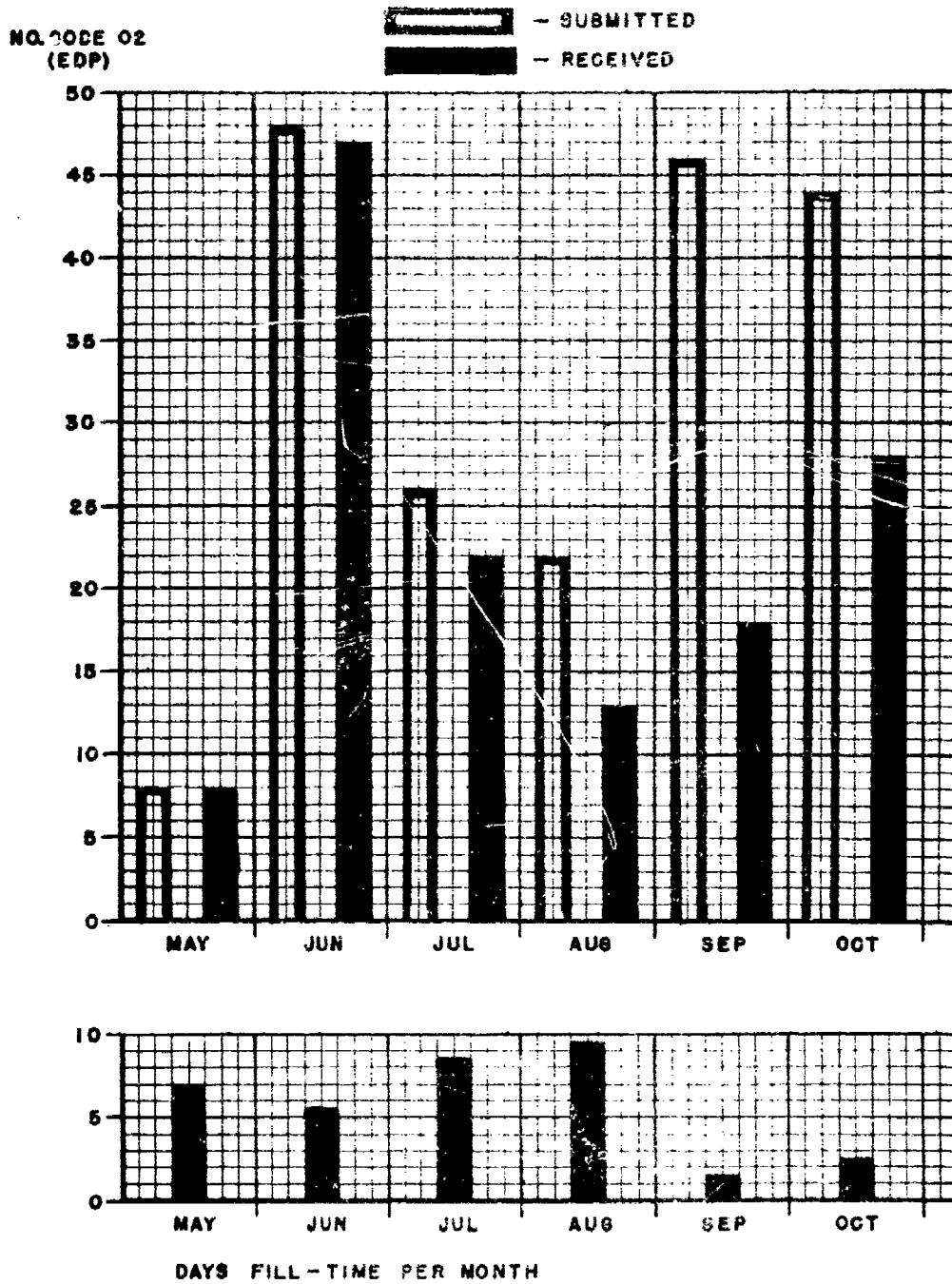
The administrative and maintenance facilities available to the



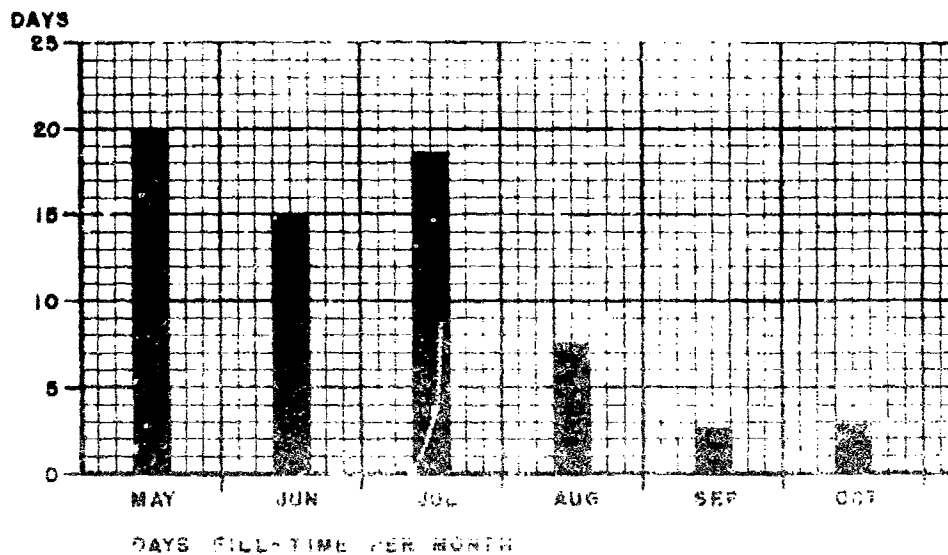
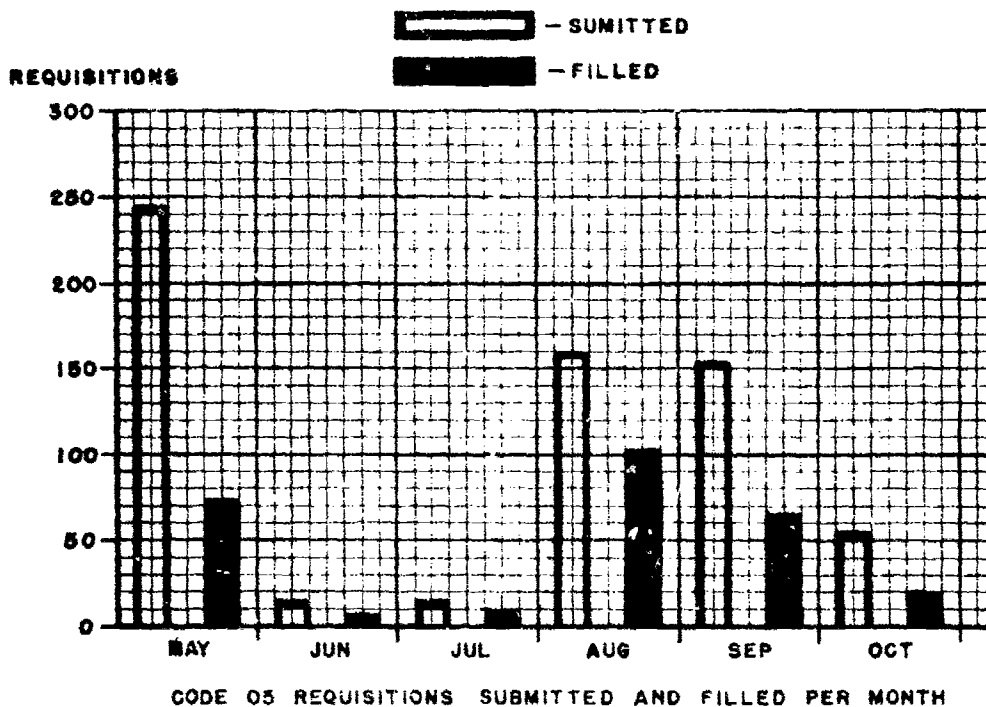
(U) FIGURE 30. Requisition channels (code 02).



(U) FIGURE 31. Number of days CV-2B's were grounded for parts.

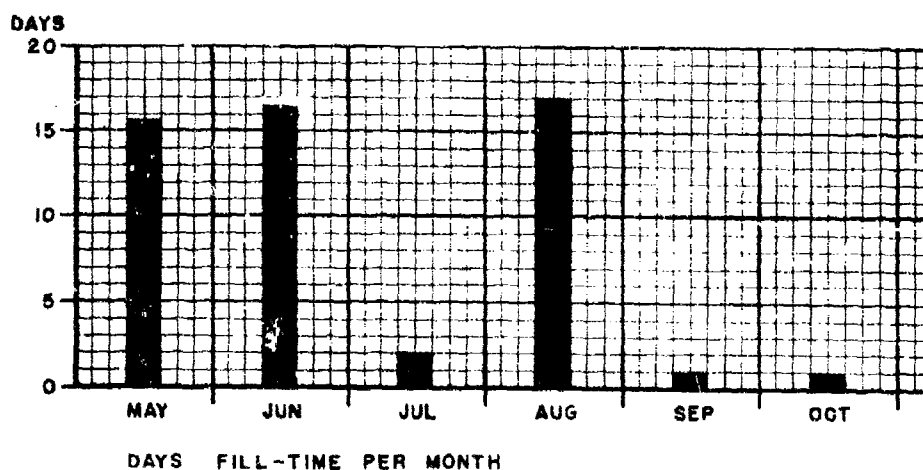
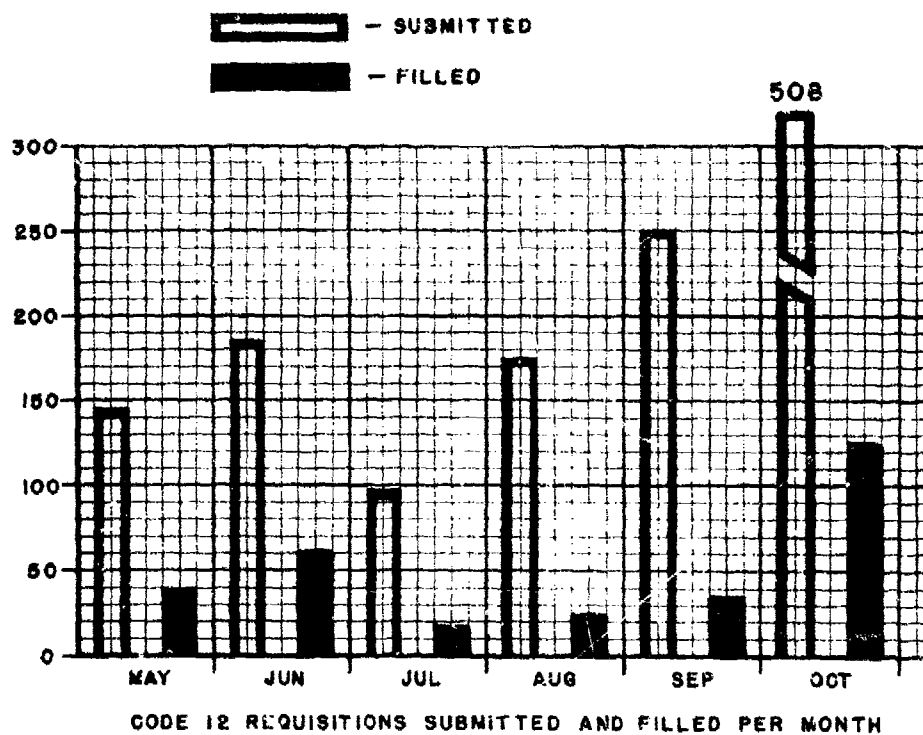


(U) FIGURE 32. Code 02 requisition data.

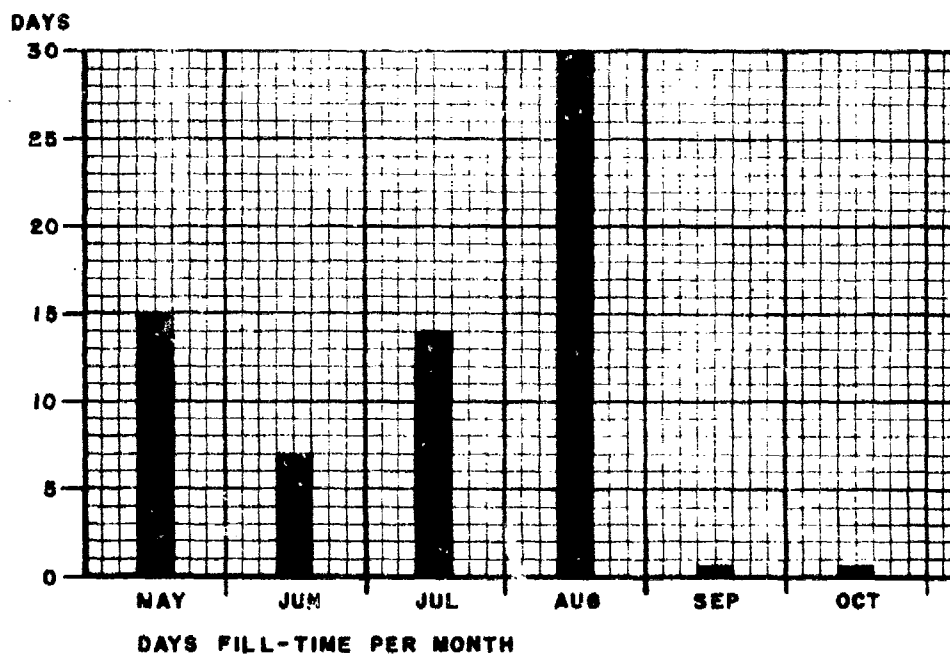
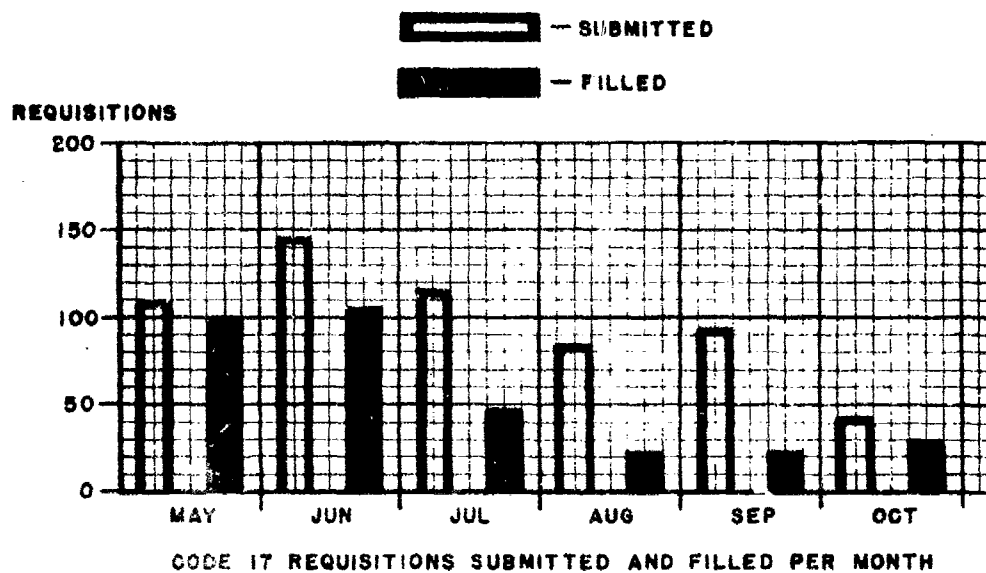


(U) FIGURE 33. Code 05 requisition data.





(U) FIGURE 34. Code 12 requisition data.



(U) FIGURE 35. Code 17 requisition data.

61st Aviation Company at Vung Tau were comparable to airfield facilities in CONUS. Figure 36 shows an aerial view of the Vung Tau facilities. Barracks, orderly room, supply room, company operations, communications, motor pool, and aircraft maintenance and supply were all located in weatherproof buildings. Heat, prevalent throughout the year, and torrential rains during the wet season, made a shelter essential for both vehicular and aircraft maintenance. A corrugated iron hangar, completely open on one side, fulfills the requirement in Vietnam. Usually there was no requirement to displace units, and a semi-permanent shelter was adequate. Storage space, parts bins, and office space were all included in the shelter, leaving adequate space and protection for extended maintenance operations. Semi-permanent aircraft maintenance shelters for other aircraft (UH-1B, O1A, U-6A, U1A) were provided. All unit commanders interviewed stated a preference for the semi-permanent shelter. There was no requirement for a portable, mobile CV-2B maintenance hangar in Vietnam. A sheltered maintenance stand is, however, required.

## 6. Conclusions

- a. Maintenance resources in Vietnam, both military and civilian, were unable to repair CV-2B aircraft with extensive crash damage in a reasonable length of time.
- b. Aircraft maintenance man-hours expended on repair of battle damage sustained by CV-2B aircraft has been insignificant when considering the overall man-hours expended.
- c. Rebuilt R-2000-7M-2 engines did not attain programmed life expectancy in Vietnam.
- d. EDP rate in Vietnam for CV-2B aircraft was above the DA goal even though there was extensive lateral transfer of parts.
- e. A semi-permanent maintenance hangar proved adequate for the CV-2B in Vietnam.

## E. (U) OBJECTIVE 5 - NAVIGATION AND COMMUNICATION EQUIPMENT

Aircraft in Vietnam fly under both civil and military air traffic control. Tactical operations and support of the ground effort are under military control. Objective 5 is concerned only with tactical operations.

### 1. Navigational Facilities in Vietnam

Navigation and communication facilities in the delta region of III and IV Corps were adequate. The relatively flat area resulted in maximum reception distance, and missions were accomplished without



61st Avn Co

326th  
Trans Det

611th DS Co

330th GS Co

705th  
Signal Bn

(U) FIGURE 36. Facilities at Vung Tau Airfield.

difficulty during year-round weather conditions. However, in the mountain and plateau areas of I and II Corps, navigational aids were of little value at low level. Navigation under minimal conditions was accomplished almost entirely by pilotage. The maneuverability and performance of the Caribou permitted nap-of-the-earth flying in deep valleys which had abrupt changes in direction and elevation. Mission aborts because of weather were infrequent.

a. Automatic Direction Finder (ADF) and Visual Omni Range (VOR)

There were 19 ADF stations located throughout South Vietnam which provided approximately 50 percent coverage of the country at altitudes below 2500 feet. These stations proved to be invaluable for low-level navigation under marginal weather conditions.

There were 3 VOR stations in Vietnam, which provided assistance for low-level navigation in approximately 20 percent of the Republic. Figure 37 shows the location of all ADF and VOR stations in RVN.

b. Ground Control Intercept

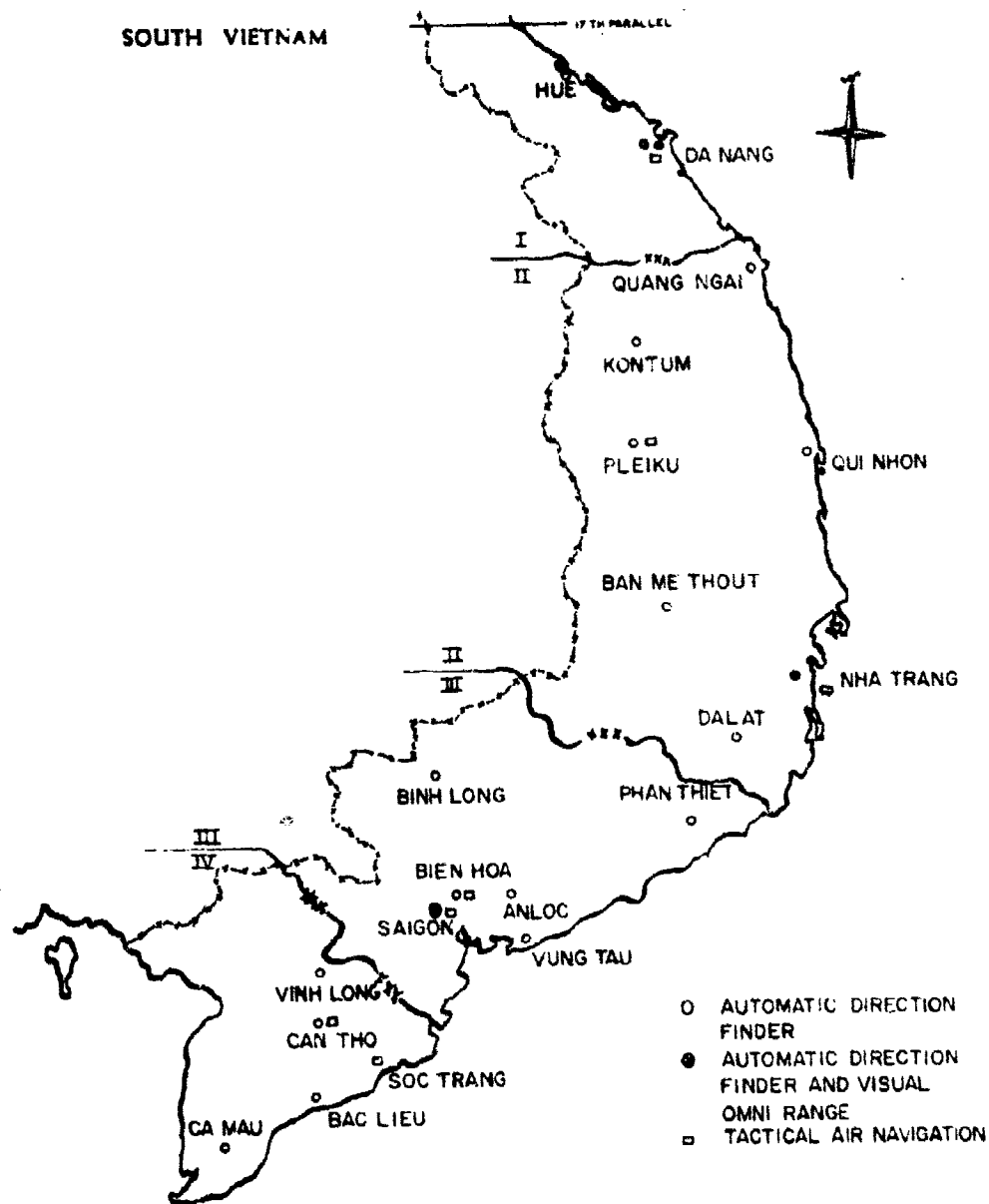
The US Air Force operated five ground control intercept (GCI) radar facilities in Vietnam, which provided positive flight-following in approximately 80 percent of Vietnam. Figure 38 shows the location of radar facilities in RVN including airfields with a ground control approach (GCA) radar. These facilities proved to be invaluable during both dry and wet seasons, not only in providing flight-following, traffic, and weather information, but also in vectoring aircraft to isolated airfields that had no navigation or communication facilities. Many missions were accomplished only because GCI was able to vector the aircraft to its destination. The APX-44 radar transponder was essential for radar contact at low level.

c. Tactical Air Navigation (TACAN)

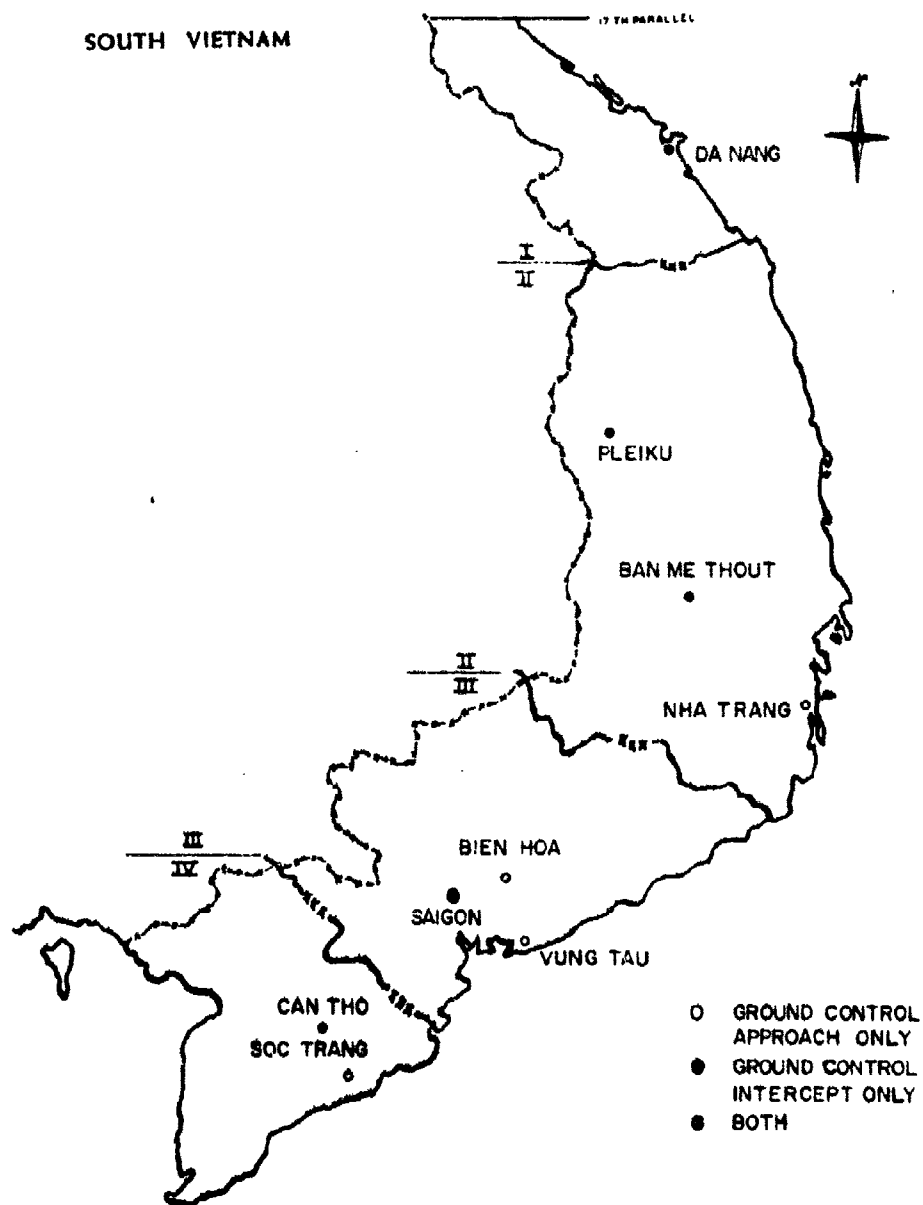
The US Air Force operated six tactical air navigation facilities in Vietnam. Figure 37 shows the location of TACAN facilities in RVN. The Caribou used in the evaluation were not equipped with TACAN receivers.

2. Low-Level Navigation

During the monsoon season, lasting about six months each year, low-level navigation takes on added significance in Vietnam. Resupply of isolated US advisor teams, outposts, and special forces strike force sites was possible only by air in most cases, since travel by road was an invitation to ambush by the Viet Cong. Low-level navigation procedures in Vietnam consisted of standard US Army procedures modified to meet the conditions of enemy, weather, and terrain peculiar to the RVN.



(U) FIGURE 37. Navigation facilities in RVN.



(U) FIGURE 38. Ground control facilities in RVN.

Radar, VOR, and ADF beacons were used whenever possible to aid in navigation. When ceilings permitted contact flying at 2,500 feet or above, navigation by pilotage was relatively simple once the pilots became familiar with the tactical maps and the area of operations.

Nap-of-the-earth flying, using normal contact flying procedures, was frequent in the I and II Corps zones as a technique for avoiding ground fire. The broken terrain and dense vegetation concealed the aircraft from ground observation. Prominent valleys and rivers simplified navigation. ADF and VOR was of little assistance during nap-of-the-earth flying because the mountains interfered with reception at the low altitude.

In the III and IV Corps zones where most of the terrain was flat, nap-of-the-earth flying was avoided because the Caribou could be detected in sufficient time for the VC to bring effective antiaircraft fire to bear at near maximum ranges. During contact conditions the Caribou seldom flew below 2,500 feet. They were flown in and out of the base of the clouds when ceilings were down to about 1,000 feet. This technique allowed the aviator to maintain his course by visual reference to the ground and afforded maximum protection from ground fire.

When the ceiling was below 1,000 feet the Caribou normally flew in the clouds using navigational aids available to assist in time-distance navigation. After flying the computed time to the destination airstrip, aviators let down, using their altimeters, to visual flight conditions. In the flat delta area, 200 feet above the terrain was considered the minimum safe altitude before aborting the letdown. After letdown the aviator then used pilotage to locate the airstrip. This procedure was used only when the aviator was familiar with the terrain.

When visibility was less than a mile and the ceiling 200 feet, it was difficult to locate landmarks. With no air-to-ground communication or navigation aids, Caribou were unduly exposed to ground fire while the crew searched for an airstrip. Dead reckoning under actual instrument conditions, followed by a letdown without navigation facilities, was found to be accurate to within two minutes of planned ETA. Lack of a positive navigational aid, however, caused as much as 10 minutes delay in locating isolated airstrips.

The HRT-2A and HRS-8 terminal guidance beacons have been evaluated by the Advance Research Projects Agency (ARPA) in Vietnam. Accuracy of the HRT-2A and HRS-8 beacons as navigational aids was excellent for locating isolated airstrips. A type of terminal guidance beacon similar to those evaluated by ARPA would make a significant improvement in low-level navigational procedures.

### 3. CV-2B Electronic Equipment

The electronic equipment installed in CV-2B's in Vietnam



provided adequate communication and navigation in all areas of Vietnam. Figure 39 shows the electronic configuration of the CV-2B's assigned to the 61st Aviation Company. Differences in installation were minor, except for weather avoidance radar which was installed in only three of the Caribou.

a. FM (AN/ARC-44)

All CV-2B in Vietnam were equipped with the AN/ARC-44 radio. It was used primarily for air-to-air and air-to-ground communication with tactical units. Air-to-ground communication was reliable with digitally tuned ground radios. Difficulty was experienced, however, in establishing air-to-ground communications with the AN/PRC series of radios with continuous tuning. These radios were often miscalibrated and the operators were unable to tune accurately to the assigned frequency. Frequently paradrop and low-level extractions had to be executed without radio contact after visually determining that the drop zone was secure. If radio contact was not made, most special forces camps would mark the drop zone with smoke when the aircraft arrived over the drop zone. Although the VC had FM radios, there were no cases where they interfered with the communications of the 61st Aviation Company. An FM frequency was available in all US Army control towers. The AN/ARC-44 was reliable within stated capability.

b. UHF-VHF (AN/ARC-55 - AN/ARC-37)

The VHF and UHF radios were the primary radios used for air-to-ground communications with control towers, GCI facilities, GCA stations, approach control and civil aviation facilities. The radios proved reliable and effective in all areas of Vietnam. The long range of the sets is particularly valuable in Vietnam where there were great distances between GCI stations.

c. Single-side-band (ARC-102)

The Caribou of the 61st Aviation Company flew missions throughout Vietnam. The only radio with sufficient range to communicate from any location and at any altitude was the single-side-band-high frequency (HF) set. Although the majority of the missions were in range of UHF and VHF stations, mountain operations required the use of HF for constant communications with flight-following facilities. The 61st Aviation Company operated a high frequency radio net during all operational hours. This communication capability was particularly valuable when maintenance problems developed in areas remote from the maintenance facilities. Administrative information and instructions were also passed on this net.

d. AN/ANP-156 Weather Avoidance Radar (WP-103)

There were three weather avoidance radars installed in

NUMBER OF AIRCRAFT	AN/ARC-44 (FM)	AN/ARC-55 (UHF)	T-366/ARC-73 (VHF)	AN/ARC-102 (HF)	AN/ARN-59 (ADF)	J-2 GYRO MAG COMPASS	AN/APX-44 TRANSPONDER	AN/ARC-51X (UHF)	ANAMP-108 (WP-103) WEATHER RADAR	RECEIVER R/104/ARN MBR
3	X	X	X	X	X	X	X	X	X	X
4	X	X	X	X	X	X			X	
2	X	X	X		X	X			X	
4	X	X			X	X			X	
3	X	X			X	X			X	

(U) FIGURE 39. CV-2B electronic configuration, 61st Aviation Company.

aircraft of the 61st Aviation Company during the evaluation. Weather avoidance radar was universally praised by US Army aviators. During the monsoon season the AN/ANP-158 enabled the aircraft to penetrate squall lines and heavy rainshowers, avoiding areas of thunderstorms. Night flights were made into areas of severe weather with confidence since the AN/ANP-158 clearly differentiated areas of thunderstorms and areas of heavy rain. It was particularly valuable during low-level flying under instrument conditions.

#### 4. Maintenance

The 258th Signal Detachment was organized under TOE 11-500D and was authorized one officer and six enlisted men. The detachment had facilities for repair of the following equipment installed in the Caribou:

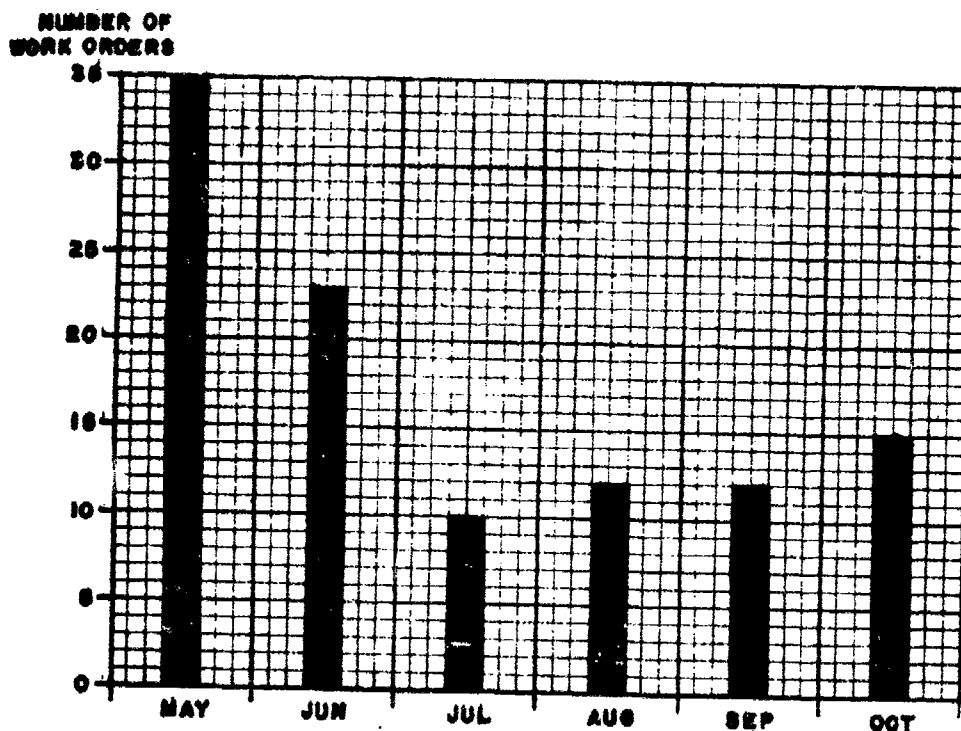
- a) AN/ARN-30D (VORNAV) (OMNI)
- b) AN/ARN-59 (ADF REC)
- c) J-2 Gyro Compass System
- d) T-366 (VHF Emer)
- e) AN/ARC-102 (HF)
- f) AN/ANP-158 (WP-103) (Repaired only by the Collins Radio Corporation's technical representative.)

The AN/APX-44 radar transponder was maintained by the 255th Signal Detachment (Avionics) at Tan Son Nhut Airport.

Avionics discrepancies were corrected by a system of direct exchange. Figure 40 shows the number of work orders accomplished for the CV-2B of the 61st Aviation Company. On the average, one man-hour was expended on each work order, which was the time required to replace the defective equipment. The equipment lost its identity after removal. When repaired it was placed in float stock. This system of direct exchange reduced aircraft downtime attributable to avionics maintenance. A Caribou company operating independently requires an attached avionics detachment with adequate float stock. Twenty percent float stock has provided adequate support for the CV-2B operation in Vietnam.

#### 5. Supply

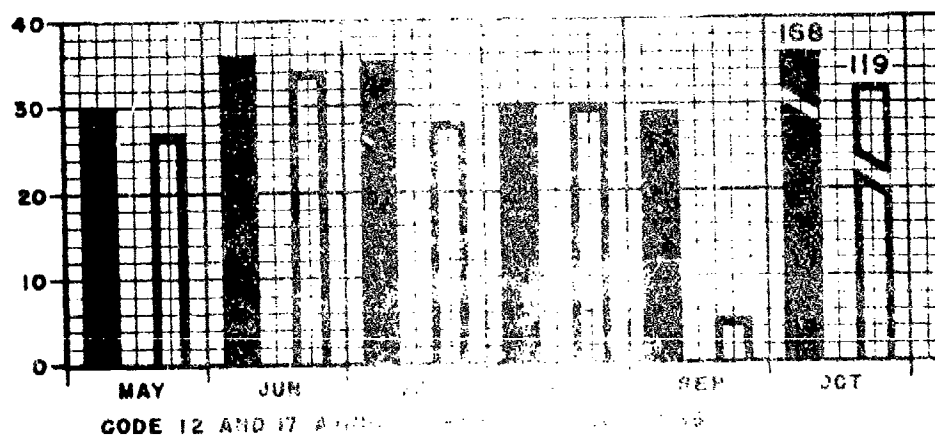
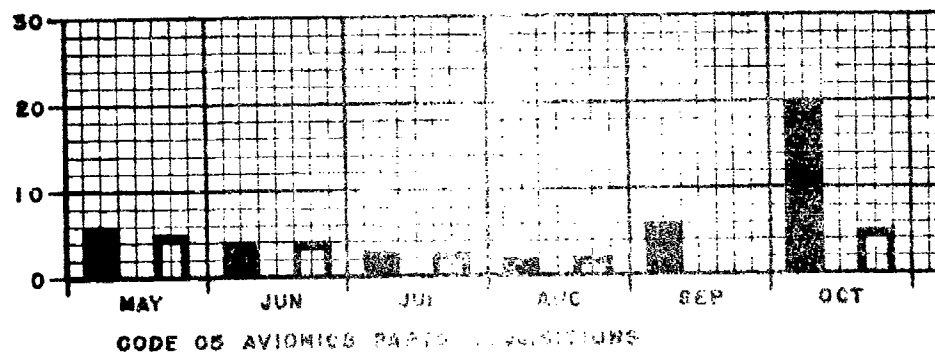
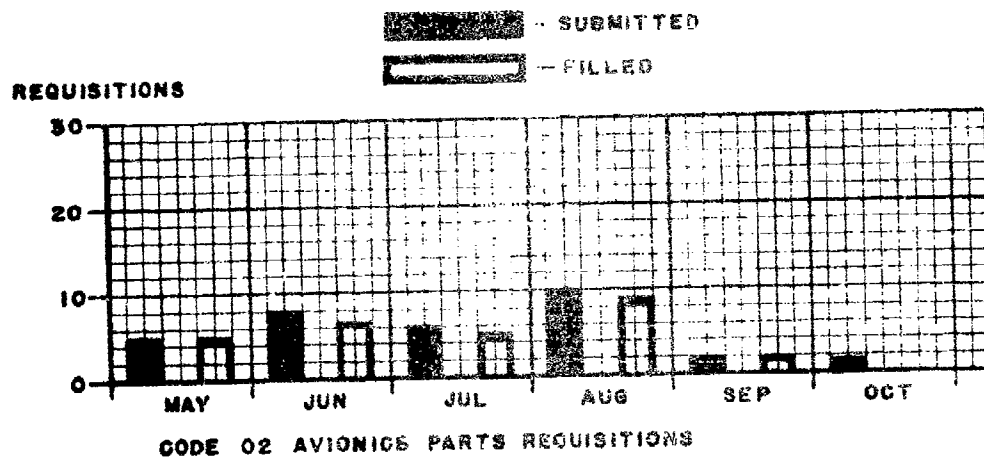
Avionics supply was satisfactory throughout the evaluation period. FDP's did not affect the aircraft since they were all filled from float stock. The requisition experience attributed directly to the electronics equipment installed in the CV-2B of the 61st Aviation Company is shown in figure 41.



(U) FIGURE 40. Signal work orders.

## 6. Conclusions

- a. The AN/ARC-102 (HF) provided the Caribou with an extended communication capability at low altitude from distant locations in Vietnam.
- b. The AN/ANF-158 weather avoidance radar was especially valuable during the monsoon season in Vietnam.
- c. A portable terminal guidance beacon similar to the HRT-2A and HRS-8 located at airfields without navigation facilities would reduce exposure and turnaround time for CV-2B aircraft operating during periods of low ceilings and reduced visibility.
- d. Air-to-ground FM communications were frequently unsatisfactory because of the inability of the operators of the AN/PRC series of radios to tune these radios accurately to the assigned frequency.
- e. Aircraft downtime attributable to defective communications and navigation equipment was negligible.



(2) FIGURE 17. AVIONICS PARTS REQUISITIONS

## **IV. (U) CONCLUSIONS AND RECOMMENDATIONS**

### **A. GENERAL CONCLUSIONS**

1. The CV-2B Caribou, under the operational control of the corps senior advisor, special forces, or USOM provided essential support to the counterinsurgency operation in Vietnam.
2. Low-level extraction from the CV-2B is an efficient and economical means of aerial resupply.
3. TOE 1-59D, dated 27 March 1964, Aviation Company (Airmobile - Fixed-Wing), requires augmentation to support CV-2B (Caribou) counterinsurgency operations.
4. Logistical resources, less rebuild facilities, necessary to support CV-2B counterinsurgency operations in Vietnam were available in-country; the organizational maintenance capability available in the 61st Aviation Company was inadequate.
5. Limited rebuild facilities precluded repair of aircraft with extensive crash damage in a reasonable length of time.
6. The electronic configuration of the CV-2B provided an adequate communication and navigation capability for counterinsurgency operations in Vietnam.
7. A portable terminal guidance beacon is necessary to reduce exposure time at isolated airfields and drop zones.

### **B. SPECIFIC CONCLUSIONS**

1. CV-2B's allocated to each corps and operating under the operational control of the corps senior advisor provided a flexible and responsive means of accomplishing the aerial movement of personnel and supplies in the corps forward areas.
2. CV-2B qualified aviators arriving in Vietnam received a comprehensive area checkout and required flight instruction in STOL procedures before they were released for operational missions.
3. One CV-2B allocated for training would expedite the operational checkout of aviators and provide a more effective unit standardization program.
4. The CV-2B was able to airland supplies to special forces camp sites that were previously resupplied only by paradrop.

5. In areas where it can be used, the LOLEX method of aerial delivery of supplies was more efficient and economical than the paradrop technique.

6. LOLEX was the most accurate air delivery technique used by the CV-2B aircraft in Vietnam.

7. The CV-2B STOL characteristics and LOLEX capability provided 5th Special Forces Group with flexibility in selecting the most effective method for aerial delivery of supplies to isolated camp sites and patrol bases.

8. TOE 1-59D, dated 27 March 1964, Aviation Company (Airmobile - Fixed-Wing), does not provide adequate command, control, and maintenance personnel and equipment for counterinsurgency operations. (See annex E.)

9. The AN/PRC-42 VHF radio would permit the company to tie in with existing civilian air traffic control facilities.

10. A maintenance stand designed specifically for the engine section of the CV-2B would expedite daily, intermediate, and periodic inspections, and demand maintenance.

11. A hoist platform similar to the Abbey or Hyster device provided at each airfield where CV-2B maintenance is performed would expedite maintenance on the tail section and eliminate a serious safety hazard.

12. Using military and civilian maintenance resources in Vietnam, approximately one year was required to repair CV-2B aircraft with extensive crash damage.

13. Aircraft maintenance man-hours expended on repair of battle damage sustained by CV-2B aircraft was insignificant when considering the overall man-hours expended on all types of maintenance.

14. Rebuilt R-2000-7M2 engines attained only 32 percent of programmed life expectancy in Vietnam.

15. EDP rate in Vietnam for CV-2B aircraft was above the DA desired goal even though there was extensive lateral transfer of parts. (See figure 31.)

16. A semi-permanent maintenance hangar proved adequate for CV-2B in Vietnam.

17. The AN/ARC-102 (HF) provided the Caribou with an extended communication capability at low altitudes from distant locations in Vietnam.

18. The AN/ANP-158 (WP-103) weather avoidance radar was especially valuable during the monsoon season in Vietnam.

19. A portable terminal guidance beacon similar to the HRT-2A and HRS-8 located at airfields without navigation facilities would reduce exposure and turnaround time for CV-2B aircraft operating during periods of low ceiling and reduced visibility.

20. Air-to-ground FM communications were frequently unsatisfactory because of the inability of the operators of the AN/PRC series of radios to tune these radios accurately to the assigned frequency.

21. Aircraft downtime due to defective communication and navigation equipment was negligible.

#### C. GENERAL RECOMMENDATIONS

1. The technique of placing the CV-2B under operational control of the supported units should be considered as the normal means of control in a counterinsurgency situation.

2. The low-level extraction technique should be adopted by the US Army as a standard aerial delivery method.

3. TOE 1-5, dated 27 March 1964, Aviation Company (Airmobile - Fixed-Wing) should be augmented with additional personnel and equipment for counterinsurgency operations. (See annex E.)

4. CV-2B aircraft with extensive crash damage should be evacuated to an established rebuild facility for repair.

5. A portable terminal guidance beacon should be adopted as standard equipment for use at remote airfields and drop zones without navigational aids.

6. Specifications and standards of quality control for rebuilt R-2000-7M2 engines should be examined by appropriate CONUS agencies with the view of determining how programmed life of the engine can be attained.

#### D. SPECIFIC RECOMMENDATIONS

1. CV-2B aircraft should continue to operate under the operational control of the supported unit or agency.

2. Four CV-2B aircraft should be allocated to the 5th Special Forces Group, Vietnam.

3. One CV-2B should be allocated to the 61st Aviation Company for unit training.



4. TOE 1-59D, dated 27 March 1964, should be augmented as indicated in annex E.

5. The installation of the WP-103 weather avoidance radar and the AN/ARC (HF) radio on all CV-2B's in Vietnam should be expedited.

6. A portable terminal guidance beacon similar to the HRT-2A and HRS-8 should be issued to advisor teams and special forces teams in Vietnam for use at airfields and drop zones without navigational aids.

(U) ANNEX A

ENEMY, WEATHER, AND TERRAIN

The enemy, weather, and terrain represent three uncontrollable factors that influence Caribou operations in Vietnam.

1. ENEMY

As of 31 July 1964 the Viet Cong (VC) main force strength was estimated at between 31,000 and 32,000 with an additional 60,000 to 80,000 guerrilla force. The present organization was built around thousands of well-trained cadre personnel who infiltrated from North Vietnam during 1961 and 1962.

Extracts of captured documents and reports of interrogation of captured VC have revealed that VC personnel infiltrating from North Vietnam have received training in the use of small arms against airplanes and helicopters. Their training also included orientation on certain automatic antiaircraft weapons. Captured documents and interrogation reports in late 1962 and early 1963 revealed that specific and detailed training and technical literature on antiaircraft tactics and techniques were being written and disseminated to all echelons in the VC organization. Subjects included aircraft detection and identification; passive measures such as camouflage, fortifications, and air alert procedures; antiaircraft firing by rifles, automatic rifles, and machineguns; and defense against heliborne attacks.

Statistics on reported antiaircraft incidents indicate that the impact of this training effort was not felt for several months. The probable cause of this was the delay in the implementation of this training at individual and small-unit level.

There have been some reports that the VC have a small number of large caliber antiaircraft weapons. The very nature of their overall tactics, however, discourages the use of these heavier weapons unless their future plans call for larger scale operations. There have been no aircraft hits received to date in the RVN from larger than caliber .50 machineguns.

The best intelligence estimates predict that VC antiaircraft doctrine will remain basically the same unless the overall effort is escalated into larger scale conventional warfare operations.

## 2. WEATHER

The weather in the Republic of Vietnam (RVN) is largely determined by two seasonal monsoons and the effects of the topography on these winds. Frontal systems are infrequent and have little effect on the weather over RVN. (See figure A-1.)

The northeast monsoon occurs from mid-November to mid-March and brings to most of the country lower humidity, less cloudiness, and lower temperatures. All regions, except the lowlands of the eastern coast, experience clear to partly cloudy skies most of the time, producing favorable flying weather.

The spring transition period from mid-March to mid-May brings maximum temperatures and increasing humidity and thunderstorm activity to all of RVN except over the coastal lowlands.

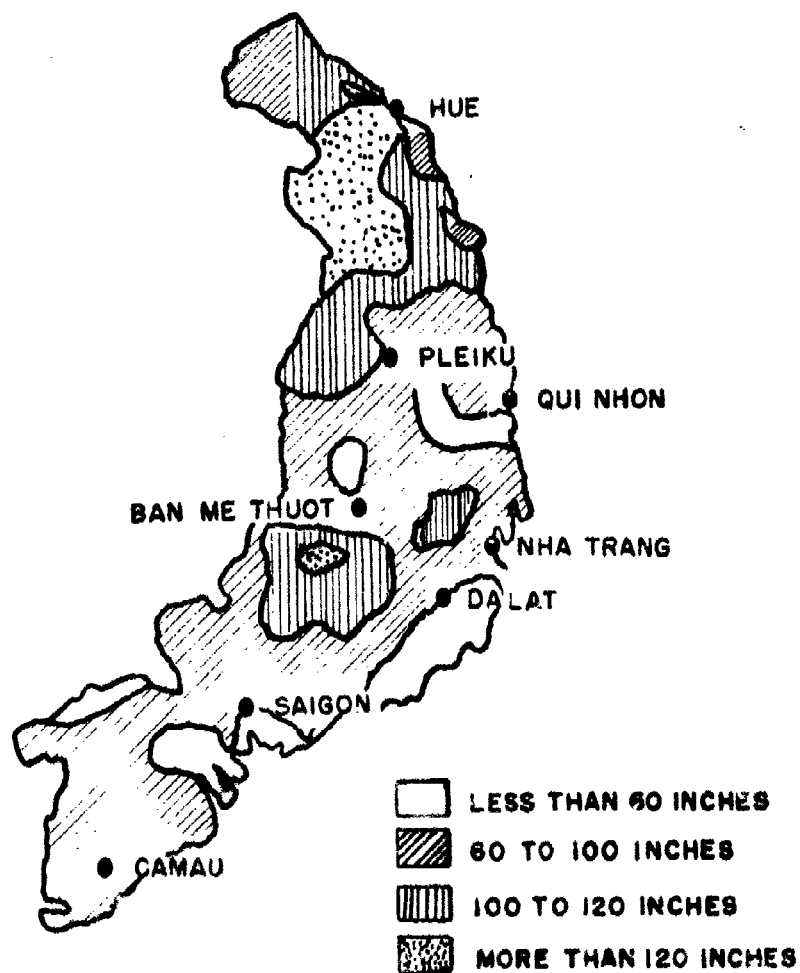
The southwest monsoon blows from mid-May to early October. This period is characterized by low clouds, heavy showers, and thunderstorms in the afternoon and evening. Fairly stable tropical temperatures and high humidity prevail over most of the area. The eastern coastlands experience relatively little cloudiness and precipitation since they are protected from the prevailing flow by the Chaine Annamitique or the interior highlands.

The autumn transition occurs from early October to mid-November. The change from southwest to northeast flow is often abrupt. This period normally sees an increase in thunderstorm activity in some locations, but in general, marks the beginning of a decrease in cloudiness and precipitation, except over the eastern coast where the changing airflow results in an onshore, up-slope flow on the eastern slopes of the interior highlands.

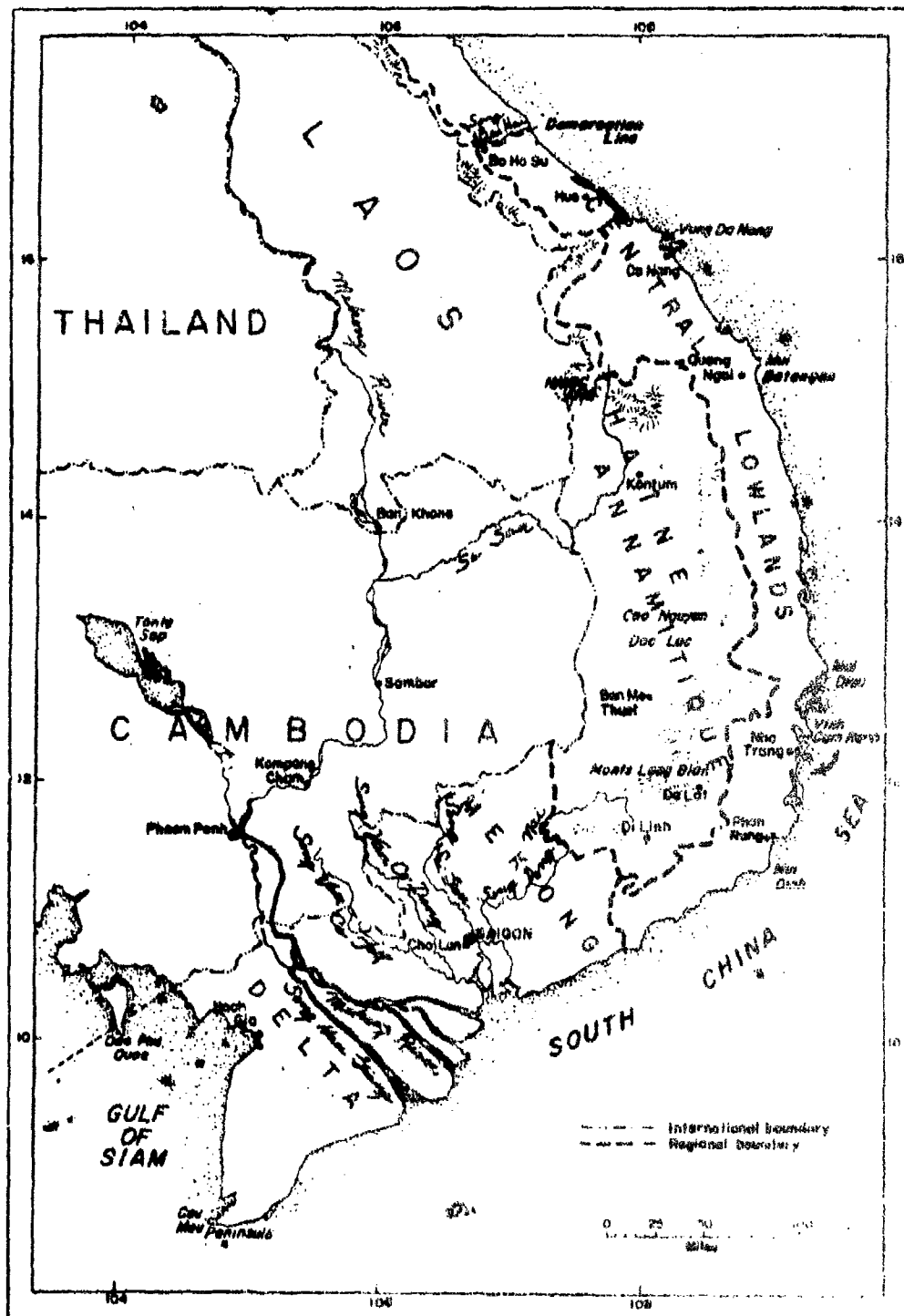
A pronounced topographic influence on the weather is caused by the Chaine Annamitique. This chain of mountains and plateaus is oriented perpendicular to the monsoonal winds. During the southwest monsoon, the lifting action of the interior highlands produces more instability which increases the cloudiness and shower activity over the entire country except the eastern coastlands. During the northeast monsoon, this influence is reversed, producing poor flying weather in all other regions.

## 3. TERRAIN

South Vietnam is composed of three major terrain areas: the highlands and plateaus in the north and central portion, the coastal plains or central lowlands, and the delta plain of the south (figure A-2).



(U) FIGURE A-1. Annual Precipitation.



(U) FIGURE A-2. Major topographic regions of South Vietnam.

The northern two-thirds of the country is dominated by the highlands region which consists of broken mountain chains and rugged hills. The area is sparsely populated, mainly by primitive, nomadic tribes.

The coastal plain (central lowlands) is an irregular narrow strip of sandy beaches and dunes, backed up by rice paddies and marshes. The plain varies from 10 to 25 miles in width, and extends from the northern boundary to the delta plain in the south. The plain is interrupted in several places by mountain chains that jut into the sea, dividing the lowlands into several compartments. This narrow strip contains several small cities and numerous heavily populated areas.

In the central position of the country the rugged mountains give way to an extensive plateau area characterized by more gently rolling terrain dotted with dense tropical forests and jungles. This region is more heavily populated than the mountainous regions and has more roads and trails.

A vast delta plain constitutes the southern one-third of the country. This area contains a dense network of rivers, streams, and unfordable canals. The area is characterized by marshes, rice paddies, and extensive mangrove swamps in the southwestern portion. The delta region is the ricebowl of the country and is heavily populated, with the largest concentration in the Saigon-Cholon area.

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(U) ANNEX B

MISSION NARRATIVES

This annex contains narratives of representative missions flown by the CV-2B's of the 61st Aviation Company in Vietnam during the evaluation. The mission reports are on file at the 61st Aviation Company. ACTIV evaluators or the project officer were crew members on three of the four missions described.



NARRATIVE DESCRIPTION OF A  
PARADROP MISSION IN SUPPORT OF  
SPECIAL FORCES IN VIETNAM

The special forces "B" detachment attached to the I Corps at Da Nang operated a forward area supply point which was responsible for supplying five "A" detachments. All resupply was accomplished by aircraft provided by the US Air Force and the US Army. The Caribou section, under the operational control of I Corps located at Da Nang provided about 50 percent of its available Caribou support to the special forces.

The S-4 of the "B" detachment determined the method of delivery based on the type of aircraft available. The Caribou, which can airland, LOLEX, or paradrop supplies, provided him with flexibility in determining the most effective method to be used. Economy of operations, based on the greatly reduced cost of air items when LOLEX or airlanded operations can replace the paradrop technique, was also a consideration. The capability of the CV-2B to maneuver in confined and restricted mountainous terrain provided the S-4 with a reasonably accurate means of paradropping supplies to long range patrols operating in areas without drop zones. This last capability was the determining factor in selecting the Caribou to perform a priority resupply mission on 30 August 1964.

The Caribou section received its Sunday mission on Saturday, the 29th. Special forces had no specific requirements, so the Caribou was scheduled to fly a general officer and party to several special forces camps for briefings. With an eight o'clock takeoff scheduled for the 30th, the crew checked in with I Corps Army aviation operations section at 0700 for latest instructions on the flight. They were told that an urgent request had just been received from the special forces "B" detachment for emergency resupply of food and water to a patrol.

The itinerary for the general included three hours of ground time at the first stop. The Caribou would drop off the party, return to Da Nang, fly the resupply mission, and then continue the first mission.

At 0900 the Caribou had returned to Da Nang for the supplies to be paradropped to the special forces strike force patrol. At 0920 the Caribou was airborne with 1720 pounds of water, food, and ammunition rigged in eight bundles. Because of the difficulty of recovering supplies in the jungle and the high probability of losing supplies, light bundles are preferred in Vietnam to the 500-pound bundle normally paradropped.

The patrol was located on a narrow ridge in steep mountainous terrain. The patrol was unable to use panels or to be seen from above since they were covered by a thick jungle canopy. Smoke was used to mark the location of the patrol. FM air-ground communication was available.

About five minutes out from the drop zone, radio contact was made with the patrol. The patrol was told to use plenty of smoke and that four passes would be made, dropping two bundles on each pass. The patrol was instructed to report accuracy so that adjustments could be made in the flight path.

Over the DZ, which could be identified only by smoke drifting through the jungle cover, the aviator placed the aircraft in a steep dive toward the smoke. Airspeed climbed to 150 knots. At 150 feet above the trees, the jumpmaster was given the green light, and the aircraft was pulled into a climb just as two bundles were discharged. The parachutes deployed quickly, oscillated once, and disappeared into the jungle.

The patrol leader reported both bundles on target. A second pass was made, but the first bundle was short. Adjustments were made and the last two passes placed the remaining bundles on target. Seven of the eight bundles were recovered, an acceptable recovery rate under the circumstances.

NARRATIVE DESCRIPTION  
OF A SCHEDULED COURIER MISSION  
IN VIETNAM

Courier flights are scheduled within each of the corps tactical zones and special zones in the Republic of Vietnam. These scheduled flights provide an orderly and efficient means of transporting troops and supplies. The length and composition of some of the runways within each of the zones limit the type of aircraft that can provide this service. The Caribou, with its STOL characteristics and its 6000-pound cargo carrying capacity, meets the requirements on a continuing basis.

The Phuoc Binh Thanh (PBT) Special Zone is an area in Vietnam about 60 miles wide and consists of provinces extending from the Cambodian border to a point six miles north of Saigon. The Viet Cong have a long history of activity in the area and ground fire is received regularly by both airplanes and helicopters that venture below 2000 feet. The terrain averages about 800 feet above sea level, and is generally flat with a few isolated mountains that rise to 3000 feet. The Phuoc Binh Thanh courier run originates in Saigon with the first point of landing at Phuoc Vinh, then to Song Be, Hon Quan, Phuoc Vinh, and back to Saigon. Average flying time for the mission is 1 hour and 50 minutes.

The crew of the Caribou assigned to the Phuoc Binh Thanh mission consisted of the unit instructor and standardization pilot, the Army Concept Team in Vietnam (ACTIV) project officer for the Caribou evaluation, and a crew chief.

At Saigon, while the Caribou was being loaded with 5000 pounds of general supplies and rations that were to be delivered to the advisory teams located along the flight route, the aircraft commander received a weather briefing. Weather was predicted to be from zero-zero to 2000 feet broken with 7 miles visibility. Typical monsoon weather with rainshowers and low ceiling prevailed throughout the Phuoc Binh Thanh special zone.

The aircraft took off at 1300 hours and heavy rainshowers and a 2000-foot overcast were encountered while turning on course to Phuoc Vinh. Paris control, the Air Force ground control intercept radar facility at Saigon, was contacted and given the route of flight. Paris control was informed that the aircraft would be in and out of the clouds at 2200 feet, and flight following was requested. During the 20-minute leg to Phuoc Vinh the aircraft was under instrument flight rules (IFR) for 5 minutes. The airfield was located without difficulty, and a close-in 180 degree approach was executed in order to reduce exposure time while the aircraft was at an altitude vulnerable to ground fire (below 2000 feet). At Phuoc Vinh, cargo and passengers were off-loaded and passengers and cargo taken on.

The aircraft, after 15 minutes of ground time, departed for Song Be and immediately encountered IFR weather. The ragged bottoms of the clouds appeared to be about 1700 feet. The elevation of Song Be airfield is 797 feet with an isolated mountain 2405 feet high about a mile to the northeast. The weather and enemy situation presented two possible decisions for the aircraft commander. First, he could fly below the clouds and attempt to circumnavigate the heavy rains. This would put the aircraft at an altitude vulnerable to ground fire. It did, however, have the advantage of better navigation and would reduce the possibility of not being able to let down on Song Be. The second possible solution was to go IFR at 2000 feet, 1205 feet above the ground, fly time-distance, and let down to 1500 (705 absolute) 5 minutes prior to arrival at Song Be. It was decided to maintain the 2000-foot altitude, and at the end of 15 minutes, attempt let down to visual flight rule (VFR) conditions. If VFR did not exist, the aircraft would return to Phuoc Vinh and wait out the weather.

The leg to Song Be consisted of 15 minutes of IFR and 5 minutes of VFR. Just five minutes out of Song Be, letdown was made to good VFR conditions with the mountain to the northeast of the airfield clearly visible. The Caribou was flown over the airfield at 1500 feet, the wind indicator was checked, and a steep 270-degree approach with 40 degrees of flaps was executed to avoid unduly exposing the aircraft to ground fire.

While the aircraft was being unloaded, the weather continued to deteriorate. The instructor pilot discussed the situation with the pilot, presenting various courses of action. It was decided to fly below the clouds and to go IFR only as a last resort. Navigation would not be a problem since there was a radio beacon located near the airfield at Hon Quan. The only problem would be extended exposure to ground fire, which would be countered by flying in and out of the base of the overcast.

About 4 minutes after takeoff, the aircraft was forced to fly between 200 and 500 feet above the terrain. The heavy rainfall and the intermittent IFR conditions provided good protection from ground fire. While the pilot was flying the instruments, the aircraft commander studied the terrain below. As the aircraft neared Hon Quan, he began calling out headings which would avoid the areas of zero visibility and place the ship in a position to make a 180-degree approach, with the airfield on the pilot side of the cockpit. About 1 minute out, at 800 feet altitude and with the airfield still not located, a blinding rainshower commenced. Visibility became zero except for straight down. While the pilot flew using the instruments, the aircraft commander searched for the airfield and called off headings. The field was first seen as the aircraft passed adjacent to it. The pilot immediately fixed its location and started an approach.

Hon Quan Airfield is located on a sloping ridge on the outskirts of a small town. It is a 1300-foot strip of unimpacted dirt. The runway heading is 050 degrees - 230 degrees. The 05 end is about 35 feet lower than the 23 end. A valley at the approach of the 05 end gives one the impression that he is too high on short final and there is a natural tendency to overshoot. A steep bank at the west end leaves no overrun. Making an approach over the rudder of a wrecked C-47, which had previously landed downhill and skidded off the 05 end, reduced the usable length to about 1150 feet.

There were several small gullies in the strip as a result of the intense rain. Because of the driving rain, the wrecked aircraft on the approach end of the strip, the natural tendency to overshoot, and the muddy runway, the pilot had to execute a go around. After another low pattern and an approach with 40 degrees of flaps on short final, the aircraft landed about 200 feet down the muddy strip. The crosswind of about 15 knots added to the difficulty of control on the narrow muddy field. Propellers were reversed, which aided in the control of the aircraft, and the aircraft came to a stop after an 800-foot landing roll.

After 20 minutes on the ground, during which passengers and cargo were loaded and the crew and passengers were thoroughly drenched, the aircraft was readied for takeoff. The Caribou took off downhill and pulled up a little early to clear the rudder of the damaged C-47 at the end of the runway. There was no improvement in the weather and of the 15 minute leg to Phuoc Vinh, 12 minutes were solid IFR at an altitude of 1700 feet, which provided about 1000 feet of terrain clearance. Flying time-distance, the aircraft broke out of the clouds about three minutes from Phuoc Vinh with the airfield dead ahead.

After 10 minutes of ground time, the aircraft took off for Saigon. Paris Control reported Saigon with 2200 feet of broken clouds. Ten miles north of Saigon, the weather improved as predicted.

The Caribou returned to Saigon after logging one hour and fifty-five minutes of flying time, fifty-five minutes of this being under IFR conditions. During the mission 6,900 pounds of cargo were delivered and 58 passengers were transported.

NARRATIVE DESCRIPTION  
OF A FORWARD AREA TROOP MOVEMENT USING  
CV-2B AIRCRAFT

A requirement developed in the ARVN 5th Division to replace a battalion of infantry located at Dau Teng with a fresh battalion from Bien Hoa, the division headquarters. The division senior advisor requested that the switch be accomplished on 4 September 1964 by Caribou allocated to the III Corps. The Army aviation element of the corps tactical operations center approved the request and scheduled the lift directly with the operations section of the 61st Aviation Company.

There was no need for a special briefing since this would be accomplished by the American advisor with the infantry battalion that was being replaced. About 400 troops and 20,000 pounds of cargo were to be moved. Two CV-2B's were assigned the mission.

The aircraft took off from Vung Tau at 0630, and proceeded to Bien Hoa, 35 miles northwest, arriving at 0650. However, there was a 300-foot broken ceiling and the tower, controlled by the Vietnamese Air Force, would not allow the aircraft to land. After holding for about 25 minutes, the aircraft flew out of controlled airspace and let down through low broken clouds and then proceeded to Bien Hoa on the deck, landing at 0730.

The crews were met by the US Army advisor to the battalion and briefed on the mission. The battalion being replaced had suffered heavy casualties and had been under attack almost constantly for the past several nights. The Caribou were to land at Dau Teng Airfield and replace the battalion on position. The aircraft would move the troops, weapons, basic load of ammunition, food, and dependents of both battalions.

The flight leader asked the American advisor to divide the troops, equipment, ammunition, and dependents into groups forming 6000-pound loads. The groups were to be positioned so as to facilitate loading. All weapons were to be cleared. Loading would commence immediately upon arrival of the battalion.

The battalion was moved by truck to Dien Hoa Airfield from a nearby assembly area. The Vietnamese officers and NCO's quickly lined the troops up and assembled the loads. The number of troops loaded did not always coincide with the number of seat belts. When this occurred, the crew chief strapped all the personnel on one side with one cargo strap. Machineguns, mortars, recoilless rifles, ammunition, food, and packs were secured in the center aisle.

The 2 aircraft with the first loads were ready for takeoff within 30 minutes after the aircraft arrived. The tower approved a VFR takeoff with a 300-foot broken ceiling. After reaching cruising altitude of

3000 feet, the flight leader called Paris Control and reported his position, altitude, and destination, and requested flight-following. Paris Control quickly established radar contact with the assistance of a transponder.

Dau Teng is located 34 miles northwest of Saigon and 13 miles east-southeast of Tay Ninh Mountain in one of the most active Viet Cong areas.

At the controls of the lead ship was a newly arrived warrant officer who was flying his first operational mission, and an instructor pilot. With Dau Teng ahead, the pre-landing check was completed, airspeed reduced to about 70 knots and, with 30 degrees of flaps, a perfect approach was made. Twenty feet from touchdown about thirty cattle were driven across the runway. The pilot and instructor hit the throttles together. The aircraft responded to the added power and, with flaps and gear on the way up, a go-around was executed.

After the cattle had been corraled, both aircraft landed and discharged their troops. The American advisor at Dau Teng briefed the pilots on the local situation. He strongly advised the crews not to overfly the area to the west of the airfield at a low altitude because of the large concentration of Viet Cong.

Loading was no problem, the troops were anxious to get out of Dau Teng and quickly responded to all orders and instructions. Takeoff was normal with both aircraft climbing above the clouds for the return trip. As the aircraft neared Bien Hoa the low overcast began to break up and by the time the aircraft were on downwind the skies were clear.

One aircraft was diverted to another mission at 1110 hours. At 1410, after a lunch and servicing break, the remaining CV-2B was again airborne.

The mission was completed at 1750. Two battalions with dependents had been switched and 20,000 pounds of cargo had been moved in a total of 25 sorties and 10 flying hours.

NARRATIVE DESCRIPTION  
OF A LOW-LEVEL EXTRACTION MISSION

Low ceilings and reduced visibility had prevented the normal aerial resupply of the special forces site at Go Dau Ha. Resupply had normally been accomplished by paradrop. A CV-28 allocated to III Corps was dispatched to the special forces supply base at Nha Trang, 21 August 1964, to pick up 6000 pounds of rations and ammunition.

At Nha Trang, the Caribou was met by two flatbed 2½-ton trucks loaded with three 2000-pound pallets. These pallets were quickly rolled into the Caribou and secured while the airplane was prepared for takeoff. One of the pioneers of IOLEX in Vietnam was in the cargo compartment as loadmaster. In the cockpit was a unit instructor pilot and a recently arrived warrant officer who was undergoing his operational checkout.

The flight from Nha Trang was south along the coast to Phan Thiet because of thunderstorms over the mountains. Near Phan Thiet Paris ground control intercept radar picked up the aircraft and provided assistance in avoiding areas of intense rainshowers. Paris reported a wide band of heavy rainshowers on course at Go Dau Ha. This report was soon confirmed as the Caribou flew into rain which reduced visibility to about ½ mile. Altitude was held at 1500 feet as the aircraft flew in and out of low clouds. When the loadmaster was given his 20-minute warning, he rechecked the load and reported it ready for drop. At the 10-minute warning, the loadmaster carefully checked the pendulum extraction system, the load, and removed the forward and vertical restraining straps. Visibility was poor, but improving. The pilot turned on the red light and notified the drop master to perform the 6-minute check. The pendulum system was rechecked, and as the loadmaster moved from the rear to the front of the cargo compartment, he removed all tiedowns.

The aircraft continued on course, maintaining direction by following a small stream. Over Go Dau Ha, the drop zone was identified. The pilot executed a 360 degree approach in order to keep the DZ in sight. At the 180 degree point the gear was extended, flaps were set at 20 degrees, and the pilot gave the 1-minute warning.

As the Caribou was turned to final approach, the loadmaster made sure all personnel were forward of the load, untied the extraction chute safety tiedown line, and reported to the pilot that he had a "hot" load. He then drew his knife, ready to cut the extraction system from the load if one of the extraction chutes failed to deploy.

The Caribou was slowed to 75 knots on short final approach to the drop zone. The pilot steadied the ship at about eight feet over the beginning of the drop zone. Power was adjusted to maintain level flight,



the green light was turned on, and the pendulum release switch was activated. Moments later, the first chute deployed, extracting the first pallet, to which was attached the extraction chute for the second load. The second and third pallets were extracted in daisy-chain fashion.

This mission was executed without ground-to-air communications, smoke, or panels to mark the DZ.

(U) ANNEX C

COMMENTS OF THE SENIOR CORPS ADVISORS AND OF THE  
COMMANDING OFFICER, 5TH SPECIAL FORCES GROUP

The annex contains comments of the senior US Army advisor to each of the ARVN corps tactical zones, and the commanding officer, 5th Special Forces Group, relative to the support provided by US Army CV-2B aircraft.

<u>Comment</u>	<u>Page</u>
US Senior Advisor, I Corps	C-2
US Senior Advisor, II Corps	C-6
US Senior Advisor, III Corps	C-10
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Commanding Officer, 5th Special Forces Group	C-17
Letter, Headquarters 5th Special Forces Group, subject: Request for Army Aviation Support of Special Forces, dated 27 October 1964	C-21

COMMENTS, SENIOR ADVISOR, I CORPS

1. What role does the Caribou play in meeting your transportation and resupply mission requirements? Please comment on response time.

Answer: The Caribou plays an extremely vital role within the I Corps area, particularly in resupply of isolated outposts and patrols. In as much as the aircraft are located in I Corps area, response is immediate.

2. For what mission is the Caribou particularly suited?

Answer: Resupply. The delivery of supplies and personnel into small and relatively unimproved landing strips. The best utilization of this aircraft in I Corps is short flights (1 hour or less) with maximum payload into small strips. In addition, the CV-2 is particularly suited to resupply by airdrop into critically small DZ areas. I Corps has been resupplying platoon size and larger units under patrol where in many cases a DZ cannot be cleared. Many of these missions are accomplished where the aircraft is subject to fire and accuracy is most important. The short field capability, ease of loading and unloading, and airdrop capability makes the aircraft the workhorse of Vietnam.

3. Can the Caribou, with reversible pitch land at all airfields in your area of responsibility? If negative, list airfields.

Answer: Yes.

4. Is liaison between the Caribou company and your headquarters adequate?

Answer: Reasonably adequate. It is felt that at any time a CV-2 must be recalled to the company or an exchange of aircraft effected, the company should call I Corps Aviation staff for coordination rather than calling company aviators. In most cases better utilization of aircraft and less juggling of schedules will result from this liaison.

5. If employed, comment on the effectiveness of low-level extraction (LOLEX) in your zone.

Answer: LOLEX in I Corps is becoming progressively more effective. This is a field where the skill of the aviator is very apparent and as in most cases, practice improved performance. When used correctly, it has the following advantages over other types of delivery:

a. Can be placed on target in larger pallets (up to 6,000 pounds, but 3,000 pounds is found to be preferred).

b. Rapid loading and minimum rigging required after pallet is packed.

c. Rapid off-loading. Even faster than airdrop due to the 1- or 2-pallet concept.

d. Fewer parachutes are required.

e. Cuts exposure time to enemy ground fire. Entire load can usually be dropped in minutes.

f. Overall mission requires much less time. LOLEX should be used more often or as often as feasible. The more missions flown, the more accurate the crew become. It is recommended that the most experienced aviators be utilized on these missions whenever possible.

6. (C) What recommendations can you make concerning the current allocation and stationing of CV-2B aircraft?

Answer: Recommend that CV-2 allocation to corps areas be considered on the basis of cargo and passengers hauled per aircraft per reporting period. Total flying time per month per aircraft does not tell a true story. I Corps can utilize four CV-2's and keep these aircraft busy on a fulltime schedule.

7. (C) Please comment on the validity of the current concept of placing allocated CV-2B aircraft under the operational control of the user.

Answer: All aircraft allocated to the corps should, of course, be under operational control of the user. To do any less than this would be to tie the user's hands. In addition the user should exercise OER responsibility while crews are under their jurisdiction. Company and battalion commanders will, without thinking, object to this saying the corps is taking away their authority, but it is not fair to the military or the individual to be rated by a commander whom he doesn't see but half a dozen times within many months.

COMMENTS, SENIOR ADVISOR II CORPS

1. What role does the Caribou play in meeting your transportation and resupply mission requirements? Please comment on response time.

Answer: Current assets include two CV-2B aircraft. At least one CV-2 is available daily for preplanned cargo or troop missions, and on Wednesday, Saturday, and Sunday both aircraft are available. (At present, requirements are greater than aircraft available. In late November or early December two additional CV-2 aircraft will be made available to II Corps when the 92nd Aviation Company becomes operational at Qui Nhon.) Response time is dictated by maintenance problems and regular periodic inspections. Since scheduled maintenance is performed at Vung Tau, the aircraft are frequently lost to the corps completely during these periods creating an undesirable backlog and disrupting schedules. Most of the time at least one of the two aircraft is available for the courier run, but this is a problem area due to requirements exceeding aircraft availability. This problem area should be resolved on or about 1 November when the 14th Aviation Battalion (Nha Trang) and the 92nd Aviation Company (Qui Nhon) become operational.

The Caribou provides a light cargo lift capability within the corps and from the corps to Saigon, the main supply base. Additionally, this aircraft provides an emergency cargo lift capability which becomes essential when an area is hit or when a short notice air assault mission develops that requires fuel and ammunition to be moved rapidly. Both CV-2's are stationed at corps and can be anywhere in the corps area in 01:30 flying time excluding load time.

2. For what missions is the Caribou particularly suited?

Answer: Hard cargo supply-resupply. The Caribou is particularly suited for transport of cargo and personnel that can be airlanded into short field strips. Cargo can be airdropped or dispensed by the low-level extraction method.

3. Can the Caribou, with reversible pitch propellers, land at all airfields in your area of responsibility? If negative, list airfields.

Answer: Yes.

4. Is liaison between the Caribou company and your headquarters adequate?

Answer: Communications are poor to LARK. Other than that, communication liaison is adequate considering the company is at Vung Tau and we are at Plieku. This will be solved on or about 1 November 1964 when the 14th Aviation Battalion at Nha Trang and the 92nd Aviation Company at Qui Nhon become operational.

5. If employed, comment on the effectiveness of low-level extraction (LOLEX) in your zone.

Answer: The LOLEX method of cargo delivery has been used extensively in the Corps area to deliver cargo to special forces sites. Percent of damage and unusable cargo has been less than 5 percent. In order to use the full capacity of LOLEX, qualified riggers and air items (parachutes, clear straps, pallets, etc.) must be positioned at key locations within the corps area. At present the Nha Trang Special Forces Logistical Command is the only place in II Corps that has the personnel and equipment to accommodate LOLEX.

6. (C) What recommendations can you make concerning the current allocation and stationing of CV-2B aircraft?

Answer: Station two at Nha Trang to support special forces. These should be used when strips are too short for C-123's, and can effectively be used for LOLEX.

7. (C) Please comment on the validity of the current concept of placing allocated CV-2B aircraft under the operational control of the user.

Answer: The concept is workable with a good liaison and coordination between crews, aviation unit, and using unit to develop best utilization of hard cargo movement. Maintenance coordination and understanding is required of the user unit to achieve best results. Caution must be exercised to avoid excess use of this aircraft for less than useful capacity loads.

COMMENTS, SENIOR ADVISOR, III CORPS

1. What role does the Caribou play in meeting your transportation and resupply mission requirements? Please comment on response time.

Answer: The Caribou provides tactical troop lift, resupply of III Corps units, and provides support for US advisory personnel through scheduled runs throughout the corps area. In addition, four special forces camps in the corps area are resupplied primarily by Caribou due to inaccessibility to these locations by road. Since most missions are either pre-scheduled or scheduled about 15 hours beforehand, the only comment we can make about response time is that it is adequate. On all missions the response has been extremely fast since requests for allocated aircraft go directly from III Corps advisor headquarters to the Caribou company and through no intermediate headquarters.

2. For what missions is the Caribou particularly suited?

Answer: The Caribou is particularly well suited for supply missions into tactical airfields in the III Corps area. They have performed airlifted resupply, parachute delivery of supplies as well as troop movements. It is also well suited for airlift of reaction forces into tactical airfields of III Corps, air resupply, LOLEX supply, and parachute supply delivery.

3. Can the Caribou, with reversible pitch propellers, land at all airfields in your area of responsibility? If negative, list airfields.

Answer: Yes, all established airfields in III Corps can accommodate the Caribou.

4. Is liaison between the Caribou company and your headquarters adequate?

Answer: Yes, the Caribou company supporting III Corps has been extremely cooperative and periodically the operations officer has visited the III Corps aviation officer to discuss aircraft utilization and minor problems.

5. If employed, comment on the effectiveness of low-level extraction (LOLEX) in your zone.

Answer: LOLEX has been used only for demonstration and one delivery to Camp Sui Dau; however, the special forces unit in the III Corps area anticipates using LOLEX at Nui Ba Ben as soon as rigger personnel are trained.

6. (C) What recommendations can you make concerning the current allocation and stationing of CV-2B aircraft?

Answer: The present allocation of CV-2B aircraft is adequate for III Corps. No problems have arisen due to the present stationing of the Caribou.

7. (C) Please comment on the validity of the current concept of placing allocated CV-2B aircraft under the operational control of the user.

Answer: The current concept of placing two Caribou under operational control of III Corps on a standing basis is the most feasible arrangement. This allows the users to program airlift and establish priorities based on III Corps policies and operations. Utilization is monitored by an aviator who is on duty with the corps headquarters as an aviation liaison officer.

8. Additional Comments:

a. III Corps use of the Caribou consists mainly of emergency resupply, resupply of isolated special forces camps, and scheduled courier runs. Due to the relative compactness of the III Corps area and inaccessibility of many air fields, helicopters are the mainstay of aviation support. However, the Caribou performs an indispensable function and corps operations would be seriously hampered without the use of two Caribou aircraft.

b. Special forces have used parachute resupply from the Caribou for one of their camps (Nui Ba Don) on the average of about two times weekly. These have been particularly successful, and during the past two months only one bundle was lost.



## COMMENTS, SENIOR ADVISOR IV CORPS

1. What role does the Caribou play in meeting your transportation and resupply mission requirements? Please comment on response time.

Answer: The CV-2B is the workhorse of the transportation and resupply effort in the IV Corps Tactical Zone. At present this corps is allocated the 4th, 8th, and 12th flyable Caribou. One Caribou is allocated daily for scheduled flights, for the movement of personnel and light weight priority cargo within each of the three division areas of the IV ARVN Corps. Each division is completely serviced twice weekly and the corps and division headquarters daily in addition to the above mentioned flights. The second Caribou is normally allocated to tactical priority missions or special forces resupply missions if a tactical emergency does not exist.

Response time is adequate, normally overnight. In the past, tactical priority has been exercised simply by taking the Caribou off scheduled flights and using it on higher priority flights.

2. For what missions is the Caribou particularly suited?

Answer: The Caribou is particularly suited for missions which require the movement of passengers and high priority cargo into small airfields, aerial delivery and LOLEX flights to which the Air Force cannot react in time and for utilizing those airfields where the gross weight limitations of USAF aircraft is restrictive.

3. Can the Caribou, with reversible pitch propellers, land at all airfields in your area of responsibility? If negative, list airfields.

Answer: The Caribou can operate in every airfield we are using in IV Corps area except Hai-Yen, which is too narrow to permit turnaround.

4. Is liaison between the Caribou company and your headquarters adequate?

Answer: Yes, however, communication problems exist. This is corrected by relaying through Saigon.

5. If employed, comment on the effectiveness of low-level extraction (LOLEX) in your zone.

Answer: LOLEX has been used effectively by special forces in resupplying remote areas. In their opinion, it has proved to be a very efficient system and is much preferred to airdrop.

6. (C) What recommendations can you make concerning the current allocation and stationing of CV-2B aircraft?

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Answer: LOLEX has been used effectively by special forces in resupplying remote areas. In their opinion, it has proved to be a very efficient system and is much preferred to airdrop.

6. (C) What recommendations can you make concerning the current allocation and stationing of CV-2B aircraft?

Answer: It would be advantageous to have one CV-2B located at this station for quick-reaction missions such as emergency ammo, and POL resupply missions, large medical evacuation missions, command post moves, etc. The present method of allocation of CV-2B aircraft is satisfactory considering the present limitation of resources in RVN.

7. (C) Please comment on the validity of the current concept of placing allocated CV-2B aircraft under the operational control of the user.

Answer: This is the most efficient method that can be used for the employment of the Caribou. It requires less administration and assures use of the Caribou for most urgent missions.

8. Additional comments: It is corps policy to utilize the South East Asia Airlift System aircraft for the movement of cargo from Saigon and other established airfields within the corps zone from which South East Asia Airlift aircraft can operate. Due to advance planning time required by the 8th Aerial Port Sqd it is often necessary to use corps-allocated CV-2Bs for the mission when time is of the essence.

COMMENTS, 5TH SPECIAL FORCES GROUP (ABN), 1ST SPECIAL FORCES

1. What role does the Caribou play in meeting your transportation and resupply mission requirements? Please comment on response time.

Answer: The Caribou is an opportune aircraft as far as this headquarters is concerned, because there are no Caribou allocated by J3 MACV to support the special forces mission in-country. The best Caribou support to special forces goes to the "B" detachments in I and III Corps and these aircraft are requested 24 hours before the required time and approved or disapproved 18 hours before mission time.

2. For what mission is the Caribou particularly suited?

Answer: The Caribou is particularly suited for troop movements, personnel parachute operations, and delivery of supplies by IOLEX, airdrop, or airlanding.

3. Can the Caribou, with reversible pitch propeller, land at all airfields in your area of responsibility? If negative, list airfields.

Answer: No, the Caribou is not yet capable of airlanding at Camp ARO in I Corps which is at present suitable only for C1E, U-10 type of aircraft.

4. Is liaison between the Caribou company and your headquarters adequate?

Answer: Liaison between the Caribou Company and this headquarters is not required since this headquarters and the "B" detachments in each corps area must refer their requests for Caribou support to the respective corps TOC. If this headquarters requires a Caribou from the Company headquarters at Vung Tau, the request must go through the TOC, Saigon and be approved there before the company can release an airplane. In other words, the Caribou Company has no control over the operational deployment of its airplanes. Liaison on matters other than requests for airplanes is satisfactory.

5. If employed, comment on the effectiveness of low-level extraction (IOLEX) in your zone.

Answer: Low-level extraction has achieved a high degree of success in actual delivery. Over 200,000 pounds of supplies have been delivered since 19 July 1964. Compared to airdrop, IOLEX is cheaper, takes less rigging time, less time in the drop zone area, with less exposure to enemy fire, and allows for continuous delivery of supplies to detachments which have airstrips rendered useless by rain. A recent example of the success of IOLEX was on 15 October at Camp TAKO, a small mountain special forces camp on the Vietnam-Laos border in I Corps which

is capable of landing only one helicopter. Because of cloud cover hanging 200 feet above the camp and the small drop zone, airdrop, the only practical means of resupply up to that time, had been unsuccessful for a number of days.

The Caribou pilot with a LOLEX load aboard, broke through cloud cover at 200 feet over the camp and made 3 sorties releasing the extraction parachute over the valley which 4 seconds later pulled the load from the aircraft which was then 10 feet above the camp's helicopter pad. In these 3 sorties the Caribou pinpointed 15,000 pounds of supplies into this camp.

6. (C) What recommendations can you make concerning the current allocation and stationing of CV-2B aircraft?

Answer: Recommend four CV-2B aircraft be allocated to support the Special Forces Logistic Support Center at Nha Trang. Unofficial word has been received by this Headquarters that three CV-2B aircraft will be allocated to special forces effective 15 November 1964.

7. Please comment on the validity of the current concept of placing allocated CV-2B aircraft under the operational control of the user.

Answer: Placing CV-2B aircraft under the operational control of the user is fine for the user. The assignment of Caribou aircraft should be made to those activities that can best utilize the inherent capabilities of the aircraft. There are instances where this has not been done in the past.

HEADQUARTERS  
5TH SPECIAL FORCES GROUP (AIRBORNE) 1ST SPECIAL FORCES  
APO 40, San Francisco, California

ASFSU

27 October 1964

SUBJECT: Army Aviation Support of Special Forces

TO: Commander  
United States Military Assistance Command Vietnam  
ATTN: Assistant Chief of Staff J3  
APO 143, San Francisco, California

1. The expansion of the Special Forces mission in the Republic of Vietnam during the 2nd and 3rd quarters of fiscal year 1965 will necessitate the daily airlift of 130,000 pounds of supplies from Nha Trang.

Present direct supporting airlift provided from the Southeast Asia Airlift System provides Special Forces a daily lift of 72,000 pounds. The present direct supporting airlift is inadequate to meet the requirement.

2. a. The present airlift supporting the Special Forces mission consists of 3 each C-123 and 2 each C-47 aircraft. The planned allowable cargo load of the C-123 is 10,000 pounds per sortie, and the C-47 carries 5,000 pounds per sortie. Flying 2 sorties daily, the aircraft have a lift capability of 80,000 pounds. Allowing for aborts due to maintenance, weather, and lack of fighter escort, the daily average is 72,000 pounds.

b. In the months June through September, an average monthly airlift of 2.5 million pounds was moved from Nha Trang. This averages out to a daily lift of 83,000 pounds. The additional airlift over and above 72,000 pounds is being provided by opportune C-124, C-130, CV-2B, CH-37, and U-1A aircraft. During July and August, opportune airlift has accounted for up to 20 percent of the total monthly airlift out of Nha Trang.

c. The 5th Special Forces Group with some 40 field detachments is now supporting some 20,000 indigenous personnel in the Civilian Irregular Defense Group and Border Surveillance (CIDG/BS) program. This supported force will increase to 30,000 personnel as the 5th Special Forces completes its buildup to some 60 operational detachments.

d. As far as logistical airlift is concerned, the problem is not solely one of additional airplanes, the problem is also concerned

ANNEX C

C-12

with providing using detachments with efficient direct delivery service on a year round basis which is not now possible with the present supporting aircraft.

(1) There are a total of 15 special forces camp sites having airstrips normally serviced by the C-123. These airstrips are periodically rendered useless by the rainy season causing the C-123 or C-47 to airdrop or divert the cargo to all-weather fields with the resultant need for vehicular convoy. These strips under bad weather conditions can be serviced by the CV-2B airlanding with reversible pitch propellers or employing LOLEX delivery.

(2) There are eight special forces camp sites which have airstrips that can accommodate the CV-2B and lighter aircraft.

(3) Eleven special forces detachments are serviced by all-weather airstrips.

(4) The remaining special forces camps are supplied by airdrop and 60 percent of these are capable of being resupplied by the more efficient and cheaper LOLEX delivery using the CV-2B.

e. Over 200,000 pounds of supplies have been delivered using LOLEX in all four corps tactical zones since 19 July 1964. Compared with conventional airdrop from the CV-2B:

(1) To airdrop 6,000 pounds costs \$1,600.00 in air items versus \$160.00 to LOLEX the same supplies.

(2) Rigging time for 6,000 pound load is reduced from 5 hours to 1 hour 10 minutes when using LOLEX.

(3) Aircraft exposure time over the drop zone area is reduced from 20 minutes to 6 minutes as the CV-2B can deliver its total load in a single pass.

(4) Accuracy is assured in LOLEX, as the pilot can pinpoint his drop, thereby reducing damage and loss significantly.

f. TOE 31-106E, Special Forces Group, provides for an organic Aviation Company. This headquarters has no organic or direct supporting aviation and has no priority with J3 MACV for the permanent allocation of Army aviation which the respective corps senior advisors enjoy. Notwithstanding this situation, the commanding officer of special forces has responsibilities which extend the length and breadth of the Republic of Vietnam and is responsible for supporting a force the size of two US divisions in over 60 locations.

g. The establishment of new special forces camps in country over the next few months will increase the requirements for airdrop most of which can be satisfied by use of LOLEX delivery from the CV-2B.

3. Request four each CV-2B aircraft be made available to support the Special Forces Logistic Support Center at Nha Trang. Flying up to 3 sorties daily, 4 CV-2B's can carry in the vicinity of 60,000 pounds daily, counting aborts for maintenance. Assignment of CV-2B's aircraft will complement the large payload, large-item carrying capability of the C-123, and would insure direct delivery of supplies to camp sites not serviced by all-weather strips on a year-round basis. Fuel, parking, maintenance, and flight planning facilities are available at Nha Trang, and supporting crews can be billeted at the special forces compound.

s/ John H. Spears

t/ JOHN H. SPEARS

Colonel, Infantry  
Commanding



ASFSU

27 October 1964

SUBJECT: Airlift Support for US Army Special Forces.

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Hq, APO 40, San Francisco, California

TO: Commander

United States Military Assistance Command Vietnam

ATTN: Assistant Chief of Staff J3

APC 143, San Francisco, California

The following airstrips are normally serviced by the C-123 by are periodically rendered useless by rain. They can be serviced by the CV-2B on a year round basis using airlanding or LOLEX.

II Corps Tactical Zone:

Ban Don

Buon Mi Ca

Chu Dron

Dak To

Dong Ba Thin

Kannack

Buon Breing

III Corps Tactical Zone:

Bu Gia Map

Bu Dop

Long Thanh

Minh Thanh

IV Corps Tactical Zone:

Tan Hiep

An Long

Moc Hoa

Don Phuoc

ASPSU

27 October 1964

SUBJECT: Airlift Support for US Army Special Forces

Hq, APO 40, San Francisco, California

TO: Commander  
United States Military Assistance Command Vietnam  
ATTN: Assistant Chief of Staff J3  
APO 143, San Francisco, California

The following airstrips can be serviced by the CV-28 only on a year round basis using airlanding or LOLEX:

I Corps Tactical Zone: ARO

II Corps Tactical Zone: Bu Prang

Polei Krong

Polei Do Lim

Plei Me

Plei Mrong

Prey Srunh

III Corps Tactical Zone: Suci Da

(U) ANNEX D

LOW-LEVEL EXTRACTION (LOLEX)

Low-level extraction (LOLEX) is a system for delivering supplies and equipment from the CV-2B aircraft flying in the close proximity to the ground (5 to 8 feet). An extraction parachute is used to cut the final restraint on the cargo in the aircraft, extract the load from the aircraft, and decelerate its horizontal momentum.

Low-level extraction is basically an adaptation of the standard airdrop system used for airdrop of heavy equipment from 1500-foot altitude except that it does not require the large recovery parachutes. It uses standard air items and expendable platforms or pallets and, therefore, has not involved the use of any new or untested equipment. The simplicity and the reliability of the system has permitted operational use since its inception on 29 July 1963 at Fort Lee, Virginia.

The Special Forces Logistical Support Center at Nha Trang received the necessary air items for LOLEX in July 1964. The first LOLEX mission performed in an operational theater was flown on 19 July 1964, to resupply special forces "A" detachment at Phrey Shrun, Vietnam. Prior to the introduction of LOLEX in Vietnam, all special forces "A" detachments that did not have an available airfield that would accommodate a C-123 or C-47, were resupplied by paradrop.

Low-level extraction in Vietnam has provided the special forces a significant increase in flexibility in resupplying camp sites not serviced by an airfield. It has shown certain significant advantages over the paradrop technique. These advantages are:

- a) Pinpoint accuracy
- b) Reduction in time and cost in rigging for a given pay load
- c) Reduction in exposure time over the DZ
- d) Reduction in time required for recovery of supplies

The primary disadvantages of LOLEX are that it requires a cleared drop zone and a low profile load configuration. High profile loads (more than 50 inches high) are very prone to tumble unless DZ and drop conditions are ideal. In some cases this limitation could reduce the maximum effective space use of the cargo compartment.

The ideal DZ for LOLEX is a relatively smooth cleared area at least 500 feet long. Most sites used have met that criteria, however, LOLEX was successful into one small, rough DZ of less than 500 feet, at Tako,

a newly established special forces camp site in the I Corps area. The camp site and DZ were located on the top of a mountain (figure D-1). The DZ was approximately 100 meters long and had one depression which divided the mountain top in half. The difficult terrain and the small usable area required initiation of the extraction system over the valley so that the load would land on the end of the short DZ. Over or under-shooting of the DZ meant total loss of the load. Ten successful single extractions were made to this special forces camp site during October 1964.

The pinpoint accuracy that can be achieved with LOLEX because of the constant positive extraction sequence makes LOLEX a desirable technique for a confined DZ even though the roughness of the DZ may preclude delivery of certain types of cargo.

#### 1. RIGGING PROCEDURES

Interim rigging instructions for LOLEX have been published in a draft TM 10-500-3, dated October 1964. This manual gives detailed instructions for rigging bulk supplies and all vehicles that can be delivered by LOLEX, and details for construction of the expendable platforms (pallets).

Low-level extraction in RVN has been used to deliver bulk supplies of all types and certain small items of equipment such as generators and water purification units.

Normally, bulk items are rigged on a 48 x 96 inch or two 48 x 48 inch expendable platforms (pallets) constructed of 3/6-inch plywood and 2 x 8 inch lumber, as in figure D-2. The loads are lashed together and to the platform by 15-foot tiedown straps and 188-inch A7A slings or 20-foot slings as shown in figure D-3.

Honeycomb shock absorbent material has not been required for delivery of bulk supplies by LOLEX in Vietnam. Rigging of vehicles, however, would require the use of this material.

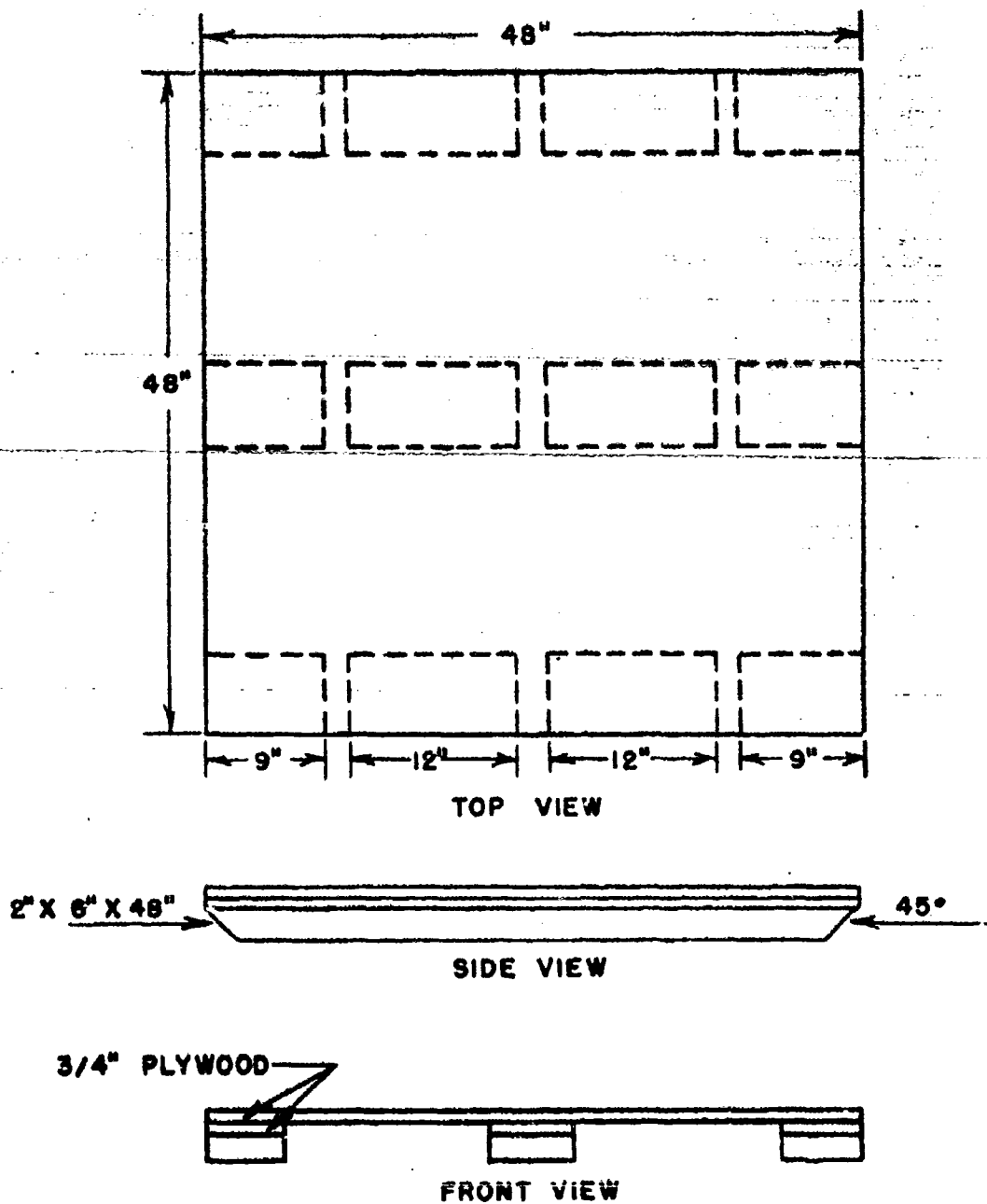
#### 2. AIRCRAFT LOADING PROCEDURES

The aircraft is prepared and loaded with the pallets for LOLEX in the same manner as for a normal airland or airdrop mission. The loads are secured and restrained in the cargo compartment of the aircraft using the aircraft's organic tiedown devices. In addition to these normal restraints to prevent shifting of the load during takeoff and in flight, the loads are secured with a final breakaway restraint.

The final restraint is a standard 60-inch shear strap connected from the bottom of the load through a shear knife of the extraction line



(U) FIGURE D-1. Tako Special Forces Drop Zone



(U) FIGURE D-2. Construction details, 48-inch skidboard assembly.



(U) FIGURE D-3. Lashing down a LOIEX load.

to the floor of the aircraft. This prevents the load from shifting after the tiedown devices are removed until it is cut by the force of the deploying extraction chute.

A forward restraint gate, or buffer board, is installed in front of each conveyer as a safety measure to prevent forward movement of the load in case of ground impact.

Installation of the aerial delivery system and securing of the loads in the aircraft are accomplished simultaneously by the crew chief and the special forces loadmaster as in figure D-4. A nylon safety cord is attached to the extraction parachute after it is installed in the pendulum release rack and connected tight to the side of the cargo compartment. With this simple safety device, the extraction chute would fall harmlessly to the floor in the event of an unintentional early release or a malfunction of the release.

The loading and rigging is not complete until the pilot has thoroughly checked the installation of the aerial delivery system and the loads for proper tiedowns and positioning as shown in figure D-5.

### 3. IN-FLIGHT PROCEDURES AND SEQUENCE

Successful accomplishment of a LOIEX mission requires a team effort between the aircraft crew and the qualified loadmaster who has



(U) FIGURE D-4. Securing a LOLEX load.



(U) FIGURE D-5. Pilot checks installation of extraction chute in pendulum release rack.





(U) FIGURE D-4. Securing a LOLEX load.



(U) FIGURE D-5. Pilot checks installation of extraction chute in pendulum release rack.

supervised the loading of the aircraft, installed the aerial delivery system, and prepared the loads for extraction.

Enroute to the drop zone the pilot gives the loadmaster a 10, 6, and 1 minute warning prior to the drop. At each of these warnings, the loadmaster, assisted by the crew chief, performs the following checks:

a) Ten minute warning:

- 1) Makes a visual check of the pendulum extraction system to insure that all components are in the correct position
- 2) Makes a visual inspection of the loads and the rigging
- 3) Reports 10 minute check complete

b) Six minute warning (pilot turns red light on):

- 1) Removes tiedown devices except the forward safety restraint gate
- 2) Crew chief lowers cargo ramp three to five degrees below the horizontal position
- 3) Insures that all personnel remain forward of the loads
- 4) Informs pilot that six minute check is complete

c) One minute warning:

- 1) Crew chief positions himself by the emergency pendulum release handle
- 2) Removes the safety line from the extraction chute
- 3) Insures that all personnel are forward of the load
- 4) Reports one minute check complete

Sometime during this period the pilot establishes FM radio contact with the ground party at the drop site. This is normally done from 5 to 10 minutes out. During this contact, the pilot will determine how the DZ is marked, request smoke to determine wind direction, and receive any current information on the enemy situation and condition of the DZ.

As the aircraft approaches the DZ, the pilot plans and executes an approach pattern just as if he were going to land. The only difference

is that the approach will be a little less steep than a STOL approach since the normal flap setting for IOLEX is 20 to 25 degrees, with an optimum drop speed of 70 to 75 knots. The landing gear is lowered for the drop, props are set at 2250 rpm and power used as necessary to maintain 70 to 75 knots and the desired 5 to 8 feet drop altitude.

Just prior to the release point the aircraft should be in a level flight at an altitude of 5 to 8 feet above that of the DZ. Figure D-6 is a schematic diagram of a IOLEX approach.

At the release point the following actions take place:

- a) The pilot calls out "Execute" as the copilot simultaneously activates the green light and the pendulum release switch.
- b) If the parachute does not fall from the pendulum release as the green light comes on, the crew chief, without further command, pulls the manual pendulum release handle.
- c) The loadmaster announces to the pilot "Chute released, load extracted," or "Chute did not release," or "Chute is on the floor," or "Chute malfunctioned outside," whichever the case may be.

As the pendulum release is activated, the extraction parachute swings out of the cargo door into the slipstream, deploys, and pulls the load out of the aircraft as shown in figures D-7 through D-12. These photographs were taken of a dual extraction IOLEX at special forces "A" detachment camp site A-Ro on 22 October 1964.

After the load has cleared the aircraft, the loadmaster reports his observation of the drop as the crew chief raises the ramp door and secures all the loose tiedown devices as the pilot climbs out using METO power of 2250 rpm and 42.5 inches manifold pressure.

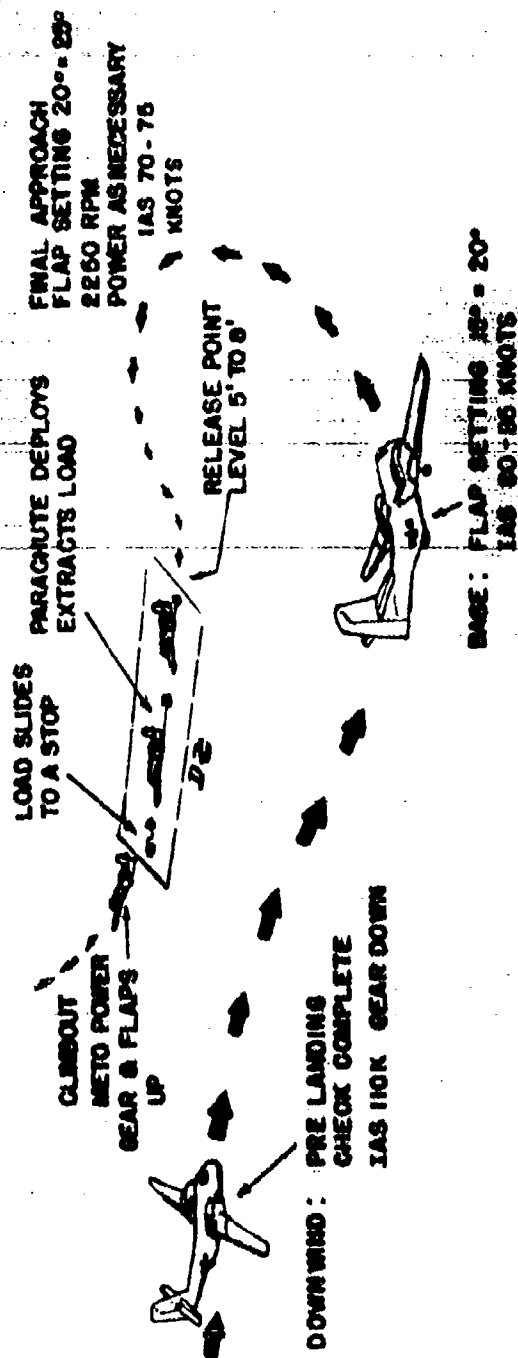
#### 4. EMERGENCY PROCEDURES

##### a. Ramp and Cargo Door Failure

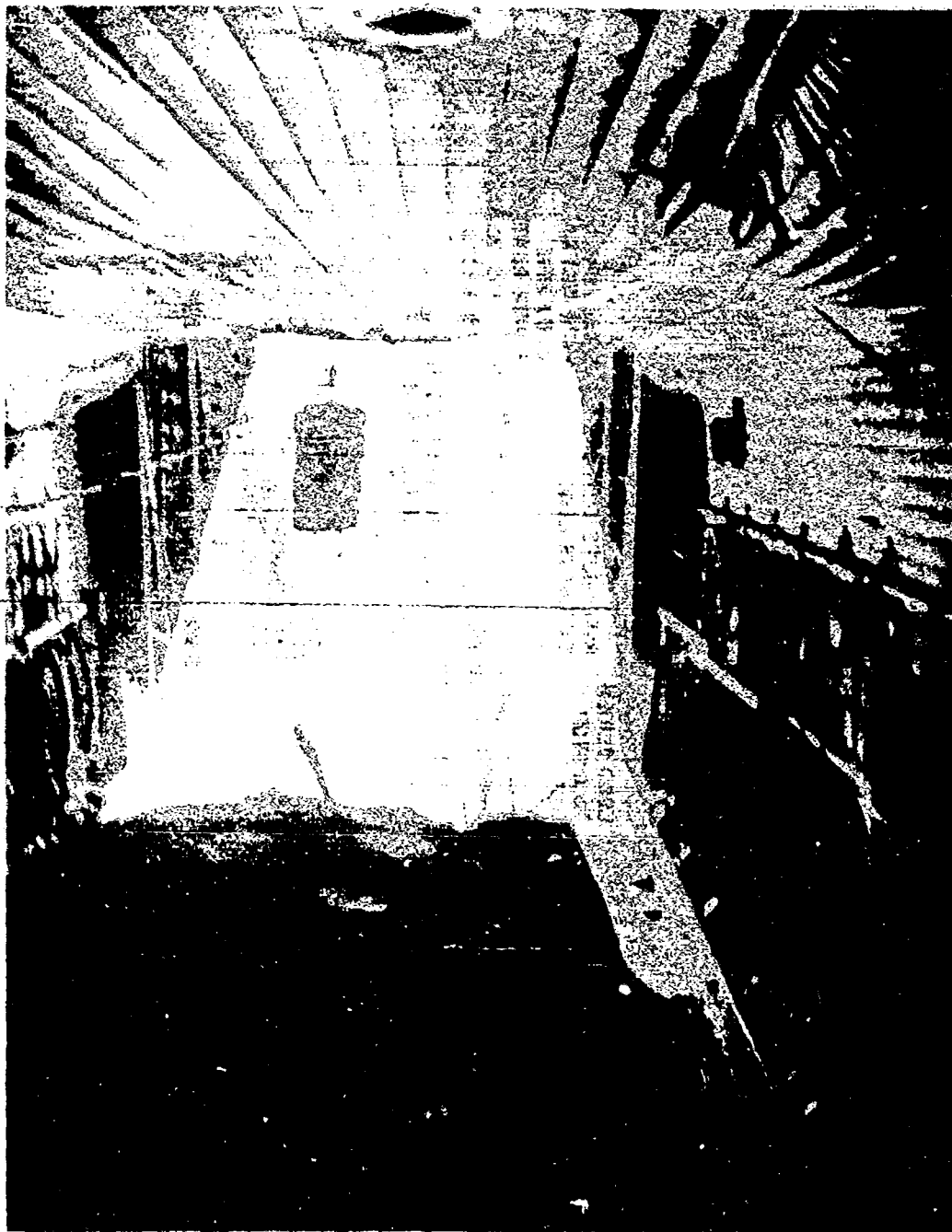
- (1) Crew chief will notify pilot of failure.
- (2) On order of the pilot, the crew chief will manually open the cargo and ramp doors.
- (3) The crew chief will notify the pilot that the door and ramp are open and in the proper position (3 to 5 degrees below horizontal).

##### b. Parachute Fails to Release from Rack

- (1) The loadmaster will notify pilot of failure.



(U) FIGURE D-6. Schematic of a LOLEX approach.



(U) FIGURE B-7. Extraction chute at release point.

ANNEX D

D-10



(U) FIGURE D-8. Extraction chute prior to deployment.

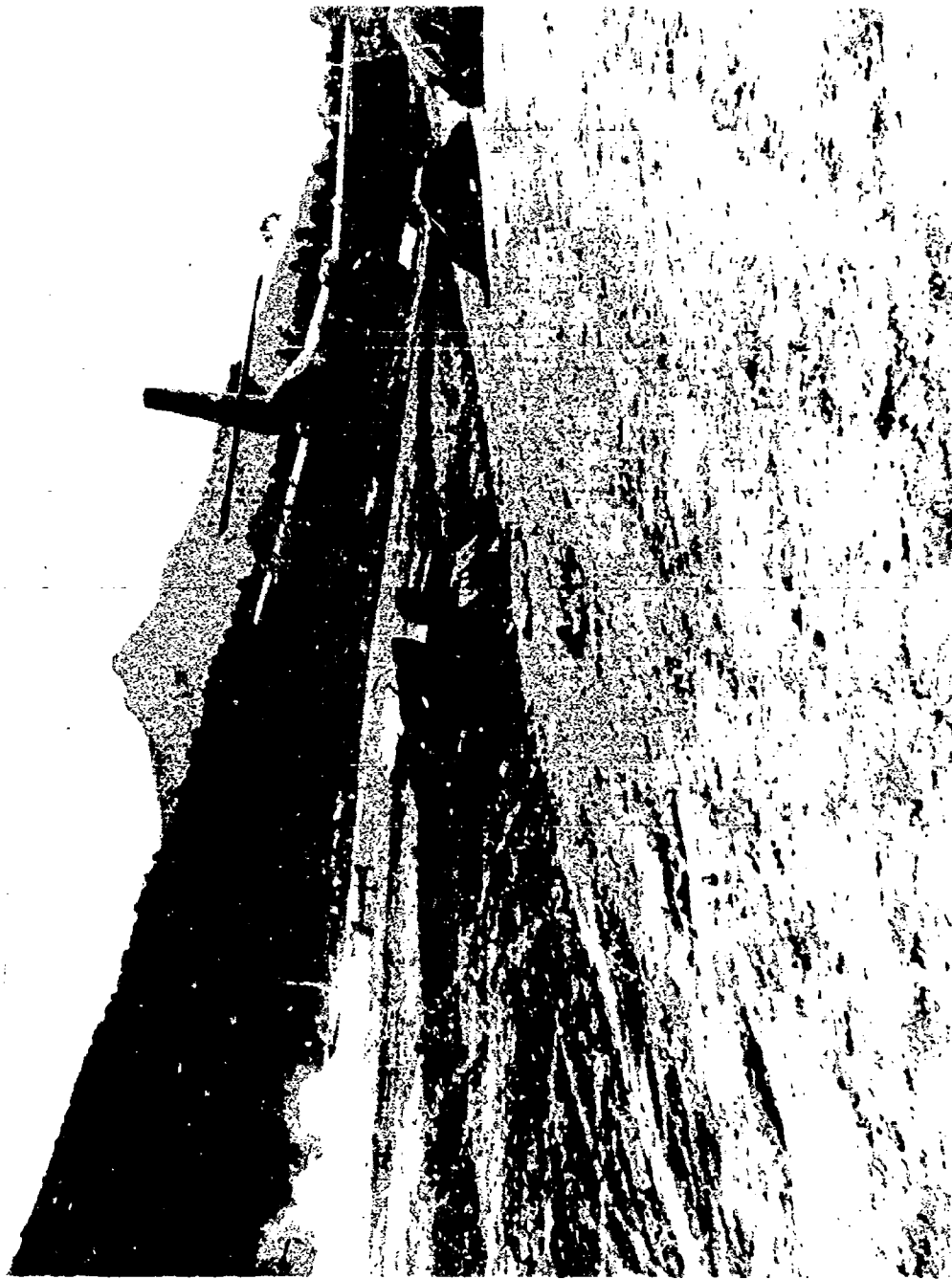


(U) FIGURE D-9. Extraction chute deployed.

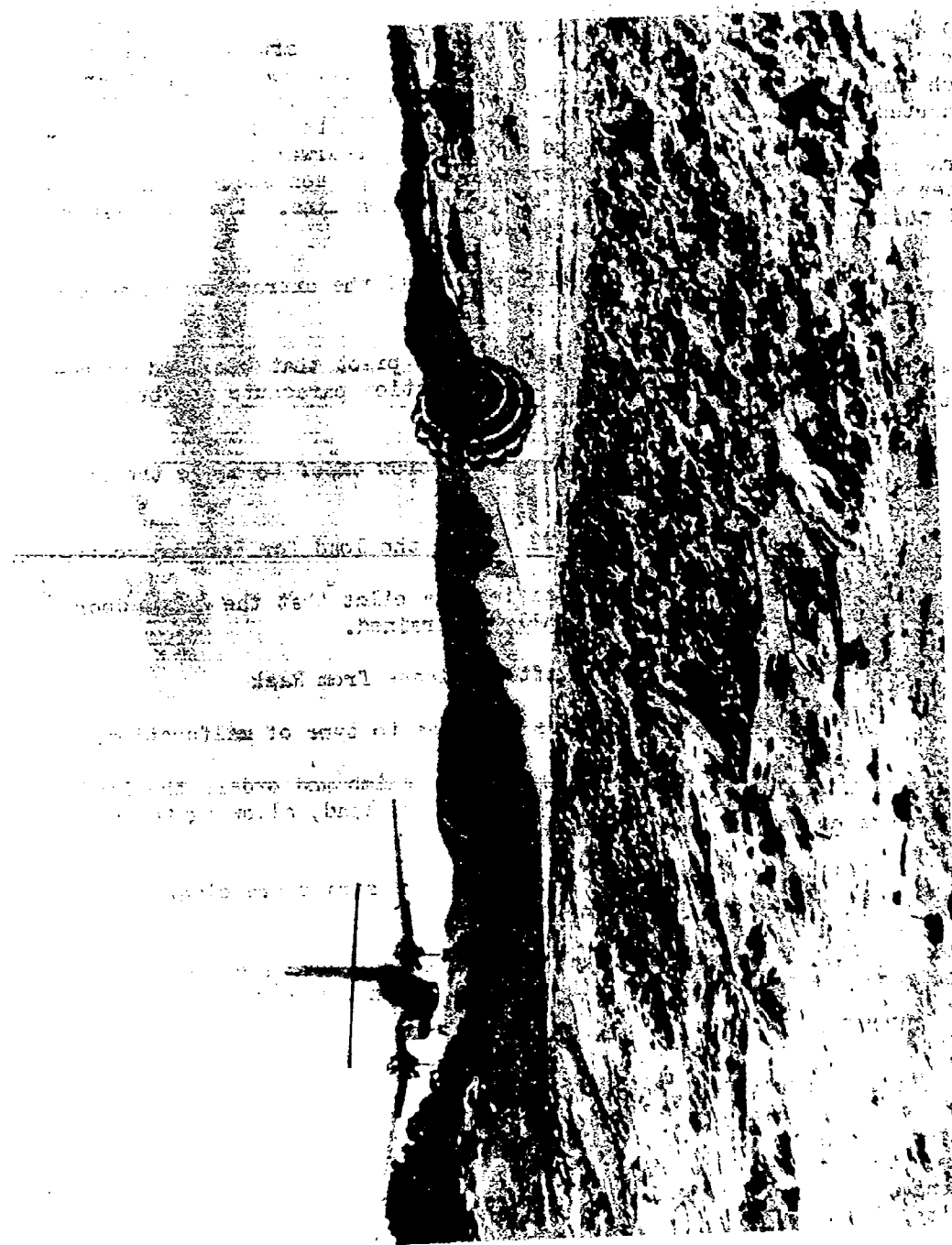


(U) FIGURE D-10. First load extracted.





(U) FIGURE D-11. First load slides to a stop as second extraction begins.



(U) FIGURE D-12. Second pallet slides to a stop as the Garibou initiates the pullup.

(2) After the airplane is at a safe altitude, the pilot will direct the loadmaster to secure the load for rearward restraint. In case of a dual load, the forward load will be secured first, after which time the extraction parachute for the forward load will be disconnected from the rear load. The restraint will be reinstalled starting at the forward end of the load and working rearward. If the extraction parachute releases after the load has been secured the loadmaster will move rearward and cut the extraction line. The loadmaster will notify the pilot of such an event.

(3) The loadmaster will reinstall the extraction parachute safety line.

(4) The loadmaster notifies the pilot that the load is restrained for safe flight and that the extraction parachute has been made inactive.

(5) The pilot will direct the crew chief to close the cargo door and ramp.

(6) The loadmaster will secure the load for forward restraint.

(7) The crew chief notifies the pilot that the cargo door and ramp are closed and the load fully restrained.

#### c. Parachute Malfunction after Release from Rack

(1) Loadmaster notifies pilot as to type of malfunction.

(2) The pilot initiates a steep climb and orders the loadmaster to cut the 20-foot sling from around the load, allowing the extraction system to fall away from the aircraft.

(3) After the extraction chute and straps are clear of the airplane, the loadmaster notifies the pilot.

(4) The loadmaster and crew chief perform the steps necessary to resecure the loads for flight with external tiedowns.

#### 5. SUMMARY

Since 19 July 1964, over 50 LOLEX missions have been flown in support of the special forces resupply effort. The procedures for LOLEX described in this annex are those that have been successfully used in Vietnam. This system has added a new dimension in aerial resupply methods in Vietnam, because of its demonstrated simplicity, accuracy, and reliability.

(U) APPENDIX TO ANNEX D

SUMMARY OF  
LOW-LEVEL EXTRACTION MISSIONS  
FLOWN IN VIETNAM FROM 19 JULY 1964 TO  
31 OCTOBER 1964

The first LOLEX mission executed in an operational theater was flown by a US Army Caribou 19 July 1964 at Phrey Shrunh, Vietnam.

Percent of damage was determined by dividing the total number of pounds damaged by the total number of pounds delivered, thus:  
 $\frac{12,500}{325,502} = 3.8 \text{ percent.}$

DATE	AMOUNT OF CARGO	TYPE OF CARGO	DELIVERY SITE	CORPS TACTICAL ZONE	SUPPLIES DAMAGED
19 Jul 64	5800 lbs	General Cargo	Phrey Shrunh	II	
20 Jul 64	5800 lbs	Fortifi- cation Material	Plei Ta Nangle	II	
20 Jul 64	5714 lbs	Fortifi- cation Material	Soni Da	III	
21 Jul 64	5800 lbs	Ammunition	Dong Tre	II	
25 Jul 64	6052 lbs 6000 lbs	Ammunition General Cargo	Dong Tre	II	3000 lbs Damaged
27 Jul 64	5800 lbs	Fortifi- cation Material	Dong Tre	II	2000 lbs Damaged
28 Jul 64	5800 lbs	Fortifi- cation Material	Go Dau Ha	III	
31 Jul 64	5800 lbs	Fortifi- cation Material	Go Dau Ha	III	
31 Jul 64	6216 lbs	Fortifi- cation Material	Plei Ta Nangle	II	

DATE	AMOUNT OF CARGO	TYPE OF CARGO	DELIVERY SITE	CORPS TACTICAL ZONE	SUPPLIES DAMAGED
11 Aug 64	5800 lbs	Ammunition and Rations	Buon Brieng	II	
11 Aug 64	5800 lbs	Rations	Buon Brieng	II	
15 Aug 64	6400 lbs	Ammunition	Bon Don	II	
17 Aug 64	4000 lbs 4500 lbs	Ammunition and Rations	ARO	I	
22 Aug 64	6000 lbs	General Cargo	Buon Brieng	II	
22 Aug 64	5800 lbs	Ammunition	Ben Phouc	IV	
22 Aug 64	4500 lbs	General Cargo	Buon Brieng	II	
22 Aug 64	5800 lbs	Fortifi- cation Material	Go Dau Ha	III	
22 Aug 64	5800 lbs	Fortifi- cation Material	Mac Hoa	IV	
25 Aug 64	6000 lbs	General Cargo	Saigon	III	
25 Aug 64	5000 lbs	Ammunition	Saigon	III	
25 Aug 64	6000 lbs	General Cargo	Soni Da	III	
25 Aug 64	6000 lbs	Ammunition	Soni Da	III	
29 Aug 64	6000 lbs	Ammunition	Ben Phouc	IV	

DATE	AMOUNT OF CARGO	TYPE OF CARGO	DELIVERY SITE	CORPS TACTICAL ZONE	SUPPLIES DAMAGED
Aug 64	6000 lbs 6000 lbs	*	*	IV	*
7 Sep 64	4000 lbs	Ammunition	Phi Ta Nagle	II	
12 Sep 64	5500 lbs	Fortifi- cation Material	Dong Tre	II	
12 Sep 64	5500 lbs	General Cargo	Dong Tre	II	
20 Sep 64	5500 lbs	Water Puri- fication Unit	Dong Tre	II	
22 Sep 64	4000 lbs	General Cargo and Lumber	Don Phuc	IV	
25 Sep 64	5000 lbs	Rations	Cam Dong	II	
25 Sep 64	4000 lbs	Rations	Huon Phouc	III	
27 Sep 64	5500 lbs	Construc- tion Material	Cam Dong	II	
1 Oct 64	3300 lbs	General Cargo	Don Phuc	IV	
8 Oct 64	3800 lbs	Construc- tion Material	Don Phuc	IV	
9 Oct 64	3200 lbs	Construc- tion Material	Don Phuc	IV	
10 Oct 64	5500 lbs	Cement and General Cargo	Plei Ta Nangle	II	
10 Oct 64	5500 lbs	Ammunition	Plei Ta Nangle	II	

\*Date, type cargo and delivery site not available

DATE	AMOUNT OF CARGO	TYPE OF CARGO	DELIVERY SITE	CORPS TACTICAL ZONE	SUPPLIES DAMAGED
14 Oct 64	5300 lbs	POL (55- gallon Drums)	ARO	I	3000 lbs Destroyed
14 Oct 64	5300 lbs	POL (55- gallon Drums)	ARO	I	4500 lbs Destroyed
14 Oct 64	4250 lbs	Ammunition and Charcoal	TAKO	I	
14 Oct 64	4300 lbs	Ammunition	TAKO	I	
15 Oct 64	5200 lbs	Construc- tion Material	ARO	I	
15 Oct 64	5800 lbs	Construc- tion Material	ARO	I	
15 Oct 64	5200 lbs	Construc- tion Material	ARO	I	
15 Oct 64	5600 lbs	Lumber and General Cargo	TAKO	I	
19 Oct 64	3500 lbs	Construc- tion Material	ARO	I	
20 Oct 64	5200 lbs	Lumber	TAKO	I	
20 Oct 64	5300 lbs	Lumber	ARO	I	
20 Oct 64	5300 lbs	Rice	ARO	I	
20 Oct 64	3250 lbs	Lumber	Don Phuc	IV	
21 Oct 64	5220 lbs	General Cargo	ARO	I	

DATE	AMOUNT OF CARGO	TYPE OF CARGO	DELIVERY SITE	CORPS TACTICAL ZONE	SUPPLIES DAMAGED
14 Oct 64	5300 lbs	POL (55- gallon Drums)	ARO	I	3000 lbs Destroyed
14 Oct 64	5300 lbs	POL (55- gallon Drums)	ARO	I	4500 lbs Destroyed
14 Oct 64	4250 lbs	Ammunition and Charcoal	TAKO	I	
14 Oct 64	4300 lbs	Ammunition	TAKO	I	
15 Oct 64	5200 lbs	Construc- tion Material	ARO	I	
15 Oct 64	5800 lbs	Construc- tion Material	ARO	I	
15 Oct 64	5200 lbs	Construc- tion Material	ARO	I	
15 Oct 64	5600 lbs	Lumber and General Cargo	TAKO	I	
19 Oct 64	3500 lbs	Construc- tion Material	ARO	I	
20 Oct 64	5200 lbs	Lumber	TAKO	I	
20 Oct 64	5300 lbs	Lumber	ARO	I	
20 Oct 64	5300 lbs	Rice	ARO	I	
20 Oct 64	3250 lbs	Lumber	Don Phuc	IV	
21 Oct 64	5220 lbs	General Cargo	ARO	I	



DATE	AMOUNT OF CARGO	TYPE OF CARGO	DELIVERY SITE	CORPS TACTICAL ZONE	SUPPLIES DAMAGED
22 Oct 64	5500 lbs	Lumber and Rations	ARO	I	
24 Oct 64	3700 lbs	General Cargo	ARO	I	
26 Oct 64	4000 lbs	General Cargo	ARO	I	
26 Oct 64	3000 lbs	Construc- tion Material	ARO	I	
28 Oct 64	5600 lbs	General Cargo	ARO	I	
29 Oct 64	5700 lbs	Construc- tion Material	ARO	I	
29 Oct 64	5800 lbs	Construc- tion Material	ARO	I	
30 Oct 64	4500 lbs	Pierced Steel Plates	ARO	I	
30 Oct 64	4500 lbs	Lumber	ARO	I	
TOTAL	325,502	-	-	-	12,500

DATE	TIME	LOCATION	NAME	STATUS	REMARKS
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(U) ANNEX E. RECOMMENDED CHANGES TO TOE 1-59D

RECOMMENDED CHANGES TO TOE 1-59D

The following changes to TOE 1-59D, dated 27 March 1964, are recommended for counterinsurgency operations similar to those conducted in Vietnam.

1. SECTION II PERSONNEL

<u>Paragraph</u>	<u>Line</u>	<u>Change</u>
01	02	Add one Captain, Executive Officer, MOS 1983
	07	Add two E-6, Airpl Tech Inspectors, MOS 679.4
02	05	Add one E-5, GCA Equip Repairman, MOS 282.20
04	04	Add four E-6, Section Chiefs, MOS 672.60
04	05	Add sixteen E-4, Asst Flight Engineers, MOS 672.30
05	02	Add one WO, Asst Maintenance Officer, MOS 6710
06	02	Add four E-5, Sr Airpl Mech, MOS 672.30
	03	Add four E-4, Airpl Mech, MOS 672.30
07	03	Add one E-4, HV Truck Driver, MOS 642.10
	04	Add one E-4, Powerman, MOS 351.10

## 2. SECTION III EQUIPMENT

Paragraph	Line Item	Change
01	401088	Add three Bayonet Knives, w/scabbard for 7.62mm Rifle
	429280	Add one Pistol, Automatic, Caliber .45
	435965	Add two Rifles, 7.62mm Semiautomatic, Lt Barrel
02	401088	Add one Bayonet Knife w/scabbard for 7.62 Rifle
	405638	Delete one Chassis Trailer Generator, 2 1/2 Ton, 2 Wheel
	435965	Add one Rifle, 7.62mm, Semiautomatic, Lt Barrel
	513620	Add one Clock, Message Center, M-2
	610280	Delete one Cipher Machine, TSEC/KL-7
	614915	Delete one Electronic Tactical Teletypewriter Security Equip TSEC/KL-7
	618117	Delete one Generator Set, Gasoline Engine, Trailer Mounted, PU-294/G Add one Generator Set, Gasoline Engine, Trailer Mounted, PU-253/U
02	657222	Delete one Radio Teletype- writer Set AN/GRL-46 Add one Radio Teletypewriter Set AN/MRC-95 Add one TRC-42, VHF Ground Mounted Radio
04	401088	Add twenty Bayonet Knives, w/scabbard for 7.62mm rifle

	435965	Add twenty Rifles, 7.62mm Semiautomatic, Lt Barrel
	637380	Delete four Radio Sets AN/ARC-102
05	401088	Add one Bayonet Knife w/scabbard for 7.62mm Rifle
	429280	Add one Pistol, Automatic, Caliber .45
	455410	Add two Tool Sets, Organi- zational Maintenance, Army Aircraft Set A
	455414	Add two Tool Sets, Organi- zational Maintenance, Army Aircraft Set B
	779922	Add one Shop Set, Ground Handling and servicing, Field Maintenance, Army Aircraft Set A
	785250	Delete one Tool Set, Organi- zational Maintenance, Army Aircraft, Set C
06	401088	Add eight Bayonet Knives, w/scabbard for 7.62mm Rifle
	435965	Add eight Rifles, 7.62mm Semiautomatic, Lt Barrel
	784040	Add eight Tool Kits, Aircraft Mechanics, General
07	401088	Add two Bayonet Knives, w/scabbard for 7.62mm Rifle
	435965	Add two Rifles, 7.62mm, Semiautomatic, Lt Barrel
	461460	Add one Truck Tractor, 5-tone, 6x6, SWB
	760010	Delete one Antenna AT-791/G

SECRET  
EXCLUDED FROM AUTOMATIC DOWNGRADING AND DECLASSIFICATION

SECRET

SECRET

EXCLUDED FROM AUTOMATIC DOWNGRADING AND DECLASSIFICATION

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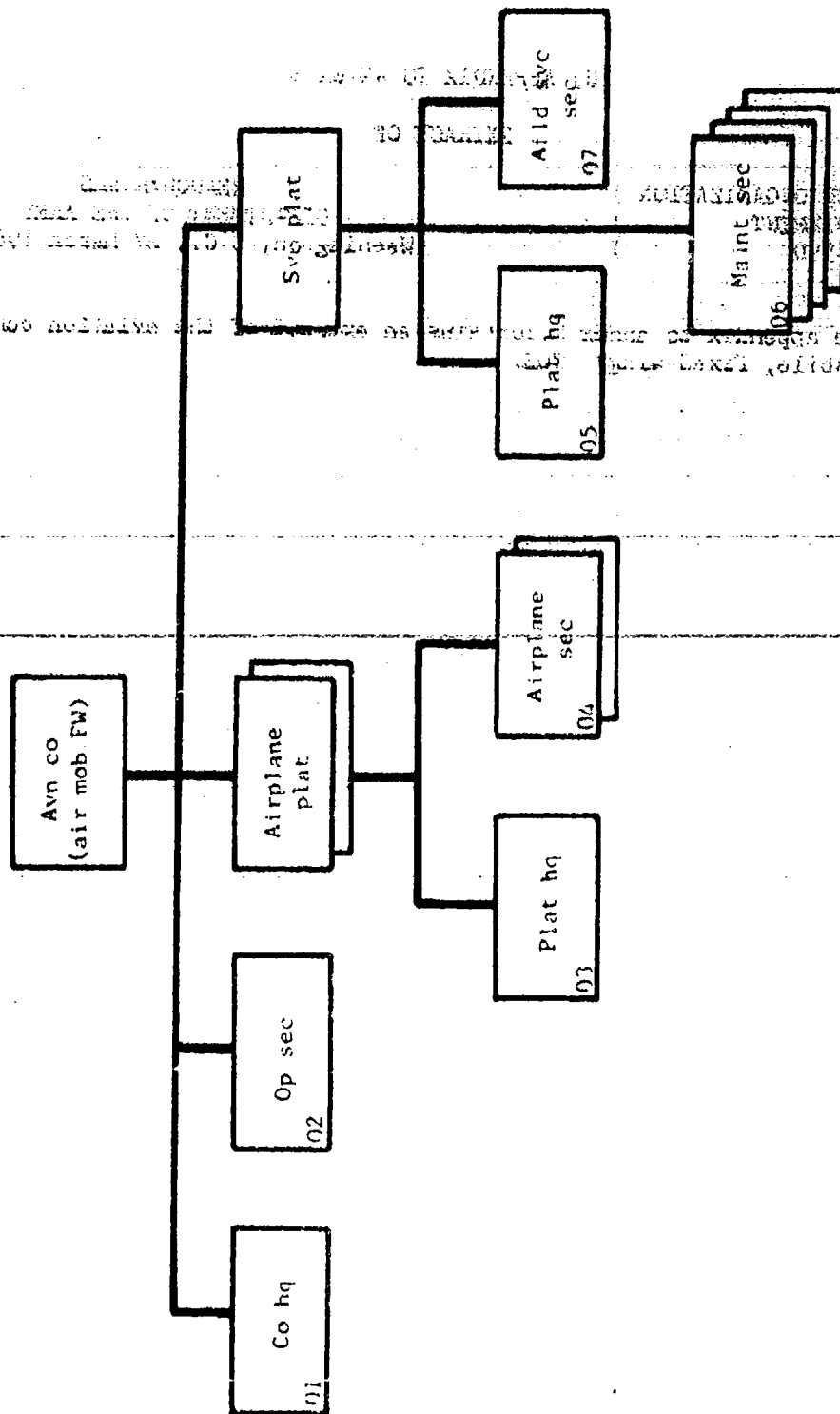
(U) APPENDIX TO ANNEX E

EXTRACT OF

TABLE OF ORGANIZATION )  
AND EQUIPMENT )  
NO. 1-59D )

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
Washington, D.C., 27 March 1964

The appendix to annex F contains an extract of the aviation company  
(air mobile, fixed-wing) TOE.



(U) FIGURE E-1. Aviation company (airmobile - fixed-wing) organization.



10E 1-580

PART OF ORGANIZATION AND EQUIPMENT  
SECTION II - ORGANIZATION

UNIT	ORGANIZATION	GRADE	NAME	STRENGTH				OFFICERS				ENLISTED																REMARKS
				FULL	ADJUT	CADRE	TOTAL	1ST	2ND	3RD	4TH	5TH	6TH	7TH	8TH	9TH	10TH	11TH	12TH	13TH	14TH	15TH	16TH	17TH	18TH	19TH	20TH	
1	SBC 01 0230 & 00-			1	2	4	7																					
01	COMPANY HEADQUARTERS																											
01	COMPANY COMMANDER	O NO	1983	1	1	1	3																					11
02	FIRST SERGEANT	E NC	47280	1	1	1	3																					
03	MESS STeward	E NC	92160	1	1	1	3																					
04	SUPPLY SERGEANT	E NC	76860	1	1	1	3																					41
05	MOTOR SERGEANT	E NC	63160	1	1	1	3																					
06	AIRPL TECH INSP	E	67940	1	1	1	3																					
07	FIRST COOK	E	92110	1	1	1	3																					
08	ARMORER	E	76820	1	1	1	3																					
09	COMPANY CLERK	E	71110	1	1	1	3																					
10	COOK	E	92110	1	1	1	3																					
11	PERSONNEL SP	E	71210	1	1	1	3																					
12	WHEEL VEH MECH	E	63110	1	1	1	3																					
13	COOKS HELPER	E	38000	1	1	1	3																					01
14	LT TRUCK DRIVER	E	71000	1	1	1	3																					07
15	SUPPLY CLERK	E	78000	1	1	1	3																					01
16	WHEEL VEH MECH H	E	63000	1	1	1	3																					01
02	OPERATIONS SECTION			24	12	9	45																					
01	FLIGHT OP OFFICER	O NO	1982	1	1	1	3																					12
02	A FLIGHT OP OFF	O NO	1982	1	1	1	3																					11
03	FLIGHT OP CHIEF	E NC	90770	1	1	1	3																					
04	COMM CHIEF	E NC	31160	1	1	1	3																					
05	GCA EQ REPAIRMAN	E	28220	1	1	1	3																					45
06	SR CON TOWER OP	E	60110	1	1	1	3																					
07	SR FLIGHT OP SP	E	90710	1	1	1	3																					
08	SR LANDING CON OP	E	90120	1	1	1	3																					
09	SR RADIO MECH	E	71110	1	1	1	3																					45
10	CLERK TYPIST	E	71120	1	1	1	3																					
11	CONTROL TOWER OP	E	90110	1	1	1	3																					
12	FLIGHT ON RD	E	90110	1	1	1	3																					
13	LANDING CON OP	E	90120	1	1	1	3																					
14	IS RADIO OPERATOR	E	90110	1	1	1	3																					
15	RADIO MECHANIC	E	31110	1	1	1	3																					01
16	RADIO TX OPERATOR	E	68110	1	1	1	3																					
17	SR SMO OPERATOR	E	31000	1	1	1	3																					
18	FLIGHT OP HELPER	E	20710	1	1	1	3																					01
19	LT TRUCK DRIVER	E	67000	1	1	1	3																					
20	SWITCHBOARD OP	E	31000	1	1	1	3																					01
21	WIREMAN	E	31000	1	1	1	3																					
03	2 AIRPLANE PLATOON HEADQUARTERS			24	12	11	47																					
01	PLATOON COMMANDER	O NO	1980	2	2	2	6																					42
02	PLATOON SERGEANT	E NC	67170	2	2	2	6																					
03	LT TRUCK DRIVER	E	67000	2	2	2	6																					07
04	2 AIRPLANE SECTIONS			48	24	8	80																					
01	SECTION COMMANDER	O NO	1980	4	4	4	12																					11
02	AIRPLANE PILOT	E	06120	28	12	4	44																					41
03	FLIGHT ENGINEER	E	67130	16	12	4	32																					
05	SERVICE PLATOON HEADQUARTERS			48	24	8	80																					
01	PLATOON COMMANDER	O NO	1980	4	4	4	12																					11
02	PLATOON SERGEANT	E NC	67170	4	4	4	12																					
03	SR ACFT PART SP	E	76610	1	1	1	3																					
04	AIRCRAFT PARTS SP	E	76610	2	2	2	6																					
05	AVN ELYR EQ MECH	E	28410	1	1	1	3																					
06	CLERK TYPIST	E	71120	1	1	1	3																					
07	WRECKER OPERATOR	E	63110	1	1	1	3																					
08	LT TRUCK DRIVER	E	78000	1	1	1	3																					97
09	RECORDS CLERK	E	71000	1	1	1	3																					01
10	SUPPLY CLERK	E	78000	1	1	1	3																					
06	4 MAINTENANCE SECTIONS			13	11	4	28																					
01	MAINTENANCE SUPV	E NC	67260	4	4	4	12																					
02	SR AIRPLANE MECH	E	67240	12	12	4	28																					
03	AIRPLANE MECH	E	67240	12	12	4	28																					
04	AIRPL MECH HELPER	E	67000	8	8	4	20																					44
07	AIRFIELD SERVICE SECTION			13	11	4	28																					
01	SECTION CHIEF	E NC	67260	1	1	1	3																					

TABLE OF ORGANIZATION AND EQUIPMENT		SECTION II - ORGANIZATION		FOG 1-59																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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			PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS		PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS	PLS

## 10: 1-5-86

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## SECTION III. EQUIPMENT

10E 1-990

CS	UNIT N. 1000	ITEM DESCRIPTION	QUANTITY			REMARKS	N. 1000
			1000	1000	1000		
01	644050	RADIOSET IN-100/100	1	1			
	644051	RADIOSET IN-100/100	1	1			
	644052	RADIO SET AN/VRC-25	1	1			
	644053	RADIO SET AN/VRC-45 MTD IN TRK 1/4 TON	1	1			
	644054	TELEPHONE SET 1A-100/PT	1	1			
	711742	MAIN AND TEL LCU W/PEAN LINKS AND 1 BRAN MOON 5/8 IN BY 16 FT	1	1			700
	711743	COMMUNIC. NAVIGATION DEAD RECKONING TYPE M-5	1	1			701
	711744	1000 PRESERVE GASOLINE AIRCRAFT GAS ON ORAL INFLATION	2	2			750
	711745	PISTOL AIRCRAFT SCALE 1 TO 500000 AND 1 TO 1000000	2	2			750
	711746	1000 FT AIRCRAFT INSPECTION TECHNICAL	1	1			
02	900010	ANTENNA AT-101/0	3	3			907
		OPERATIONS SECTION					
	100050	DECONTAMINATING APPARATUS PORTABLE 1 1/2-GT	5	5			600
	213497	BURNER ASSEMBLY SPACE HEATER	4	4			600
	213626	HEATER SPACE SOAL ON OIL 4500V 0.1W 14-5/8 IN H	4	4			600
	740008	LIGHT TRAFFIC AIRCRAFT W/2 FILTERS GREEN RED	1	1			
	621188	BAYONET KNIFE W/SCABARD FOR 7.62MM RIFLE	24	24			600
	621189	CHASSIS TRAILER RECUBATOR 2 1/2-TON 2-WHEEL	1	1			
	621190	PISTOL AUTOMATIC CAL .45	2	2			
	621191	PISTOL PYROTECHNIC	2	2			
	621192	RIFLE 7.62-MM SEMIAUTOMATIC LT BARREL	22	18			
	621193	TRAILER AMBULANCE CARGO 1 1/2-TON 2-WHEEL	1	1			
	621194	TRAILER CARGO 3/4-TON 2-WHEEL	3	3			
	621195	TRUCK CARGO 3/4-TON 6X6 LWB	1	1			
	621196	TRUCK CARGO 3/4-TON 6X6 LWB	1	1			
	621197	TRUCK UTILITY 1 1/2-TON 6X6	1	1			
	621198	CASE FIELD OFFICE MACH PLYWOOD 22-1/2 L 13-1/4 W 17 D	1	1			
	621199	CASE FIELD OFFICE MACH PLYWOOD 34 1/2 L 13 1/4 W 17 IN D	1	1			
	621200	DESK FIELD PLYWOOD 20 7/8 IN W 14 7/16 IN H 15 5/8 IN D	2	2			
	621201	DESK FIELD PLYWOOD 22 5/8 IN W 25 7/8 IN H 17 1/2 IN D	1	1			
	621202	FILING CABINET CAP SIZE STEEL GRAY 33 1/2 IN D W/LOCK	1	1			
	621203	600000 SUN WIND DUST 2 PLASTIC COLORLESS NEUTRAL GREY	5	5			506
	621204	PARACHUTE PERSONNEL BACK 28 FT DIA ORANGE WHITE SAND AND OG	1	1			250
	621205	SAFE 2 SHELVES 1 DRAWER 2 COMPARTMENT 28 H 17 W 17 1/2 IN D	2	2			
	621206	TABLE FOLDING LEGS WOOD TOP AND LEGS 36 L 24 W 27-25/32 IN H	6	6			
	621207	TENT GENERAL PURPOSE MEDTUM W/THROU W/THROU COMPLETE	2	2			600
	621208	TENT L'NER CTN PERWEARABLE TENT GENERAL PURPOSE MEDTUM	2	2			624
	621209	TOOL KIT GENERAL USE TOOLS SIG DRAWING TC-33	3	3			903
	621210	TYPEWRITER NONPBL 15 IN PAPER SIZE 42 TO 44 KEYS ELITE TYPE	1	1			
	621211	TYPEWRITER NONPBL 20 IN PAPER SIZE 42 TO 44 KEYS ELITE TYPE	1	1			
	604550	BAROMETER ML-102	1	1			
	604551	BEACON SET RADIO AN/GRN-8	1	1			
	604552	CASE MC-5	2	2			
	610010	CHEST CY-84/1	2	2			
	610011	CIPHER MACHINE TSEC/KL-7	1	1			
	610012	ELECTRONIC TACTICAL TELETYPEWRITER SECURITY EQUIPMENT TSEC/KM-7	1	1			
	610013	GENERATOR SET GASOLINE ENGINE TRAILER MOUNTED PU-4560	1	1			
	610014	GENERATOR SET GASOLINE ENGINE TRAILER MOUNTED PU-29476	1	1			
	621195	MULTIPLIER AN/PRM-15	1	1			
	621196	MULTIPLIER AN/PRM-105	2	2			
	631190	GENERATOR SET GASOLINE ENGINE PE 75	2	2			
	634475	RADAR SET AN/TPN-8	1	1			
	634476	RADIOSET IN-100/100	2	2			
	641404	RADIO SET AN/GRN-5 MTD IN TRK 3/4 TON CARGO	1	1			
	651201	RADIO SET AN/VRC-24 MTD IN TRK 1/4 TON	1	1			
	651202	RADIO SET AN/VRC-24 MTD IN TRK 3/4 TON CARGO	1	1			
	653404	RADIO SET AN/VRC-34 MTD IN TRK 3/4 TON CARGO	1	1			
	654201	RADIO SET AN/VRC-46 MTD IN TRK 1/4 TON	1	1			
	654504	RADIO SET AN/VRC-49 MTD IN TRK 3/4 TON CARGO	2	2			
	657222	RADIO TELETYPEWRITER SET AN/GWC-66	1	1			
	658387	RECLIVING SET RADIO R-511/ARC	1	1			
	660000	REELING MACHINE CABLE HAND AL-59	1	1			
	660000	REEL EQUIPMENT CL-11	1	1			
	660000	REELING MACHINE CABLE HAND AL-51	1	1			
	672380	SWITCHBOARD TELEPHONE MANUAL 56-22/PT	1	1			

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## SECTION III - EQUIPMENT

EAL NO.	EAL NO.	ITEM DESCRIPTION	QUANTITY			REMARKS
			ORIGINAL	REPLACEMENT	REPLACEMENT	
02	674365	TELEPHONE SET 1A-312/P1	3	3		
	485605	TEST SET ELECTRON YOGS 10-770	2	2		
	486400	THERMOMETER SELF-INDICATING LIQUID IN GLASS NO-7	1	1		
	689615	TOOL KIT RADIO REPAIRMAN 1A-5151/770	2	2		720
	694790	INVERTER VIBRATOR UP-6870	1	1		201
	696550	WIND MEASURING SET (AN7PNC-3)	1	1		
	698350	WIRE NO-12/11 ON REEL OR B 1/4 MI	8	8		
	698530	WIRE NO-12/11 AL-15970	6	6		
	711741	CHAIN ASY 500 LBS W/WEAR LINKS AND 1 GRAB HOOR 5/8 IN BY 1/4 IN	1	1		701
	712735	COMPUTER AIR NAVIGATION DEAD RECKONING TYPE MB-4	1	1		250
03	744410	LIFE PRESERVER UNDER ARM AIRCRAFT GAS OR ORAL INFLATION	1	1		230
	763200	PLOTTER AIRCRAFT SCALE 1 TO 500000 AND 1 TO 1000000	1	1		230
	960010	ANTENNA AT-72170	4	4		907
04	108090	DECONTAMINATING APPARATUS PORTABLE 1 1/2-0T	2	2		600
	108171	DETECTOR KIT CHEMICAL AGENT VGH	2	2		600
	213497	BURNER ASSEMBLY SPACE HEATER	2	2		600
	332628	HEATER SPACE COIL OR OIL 45000 BTU 18-5/8 IN H	2	2		600
	401088	BAYONET KNIFE W/SCABARD FOR 7.62MM RIFLE	6	6		600
	422280	PISTOL AUTOMATIC CAL .45	2	2		
	435965	RIFLE 7.62-MM SEMIAUTOMATIC LT BARREL	2	2		
	437113	TRAILER AMPHIBIOUS CARGO 174 TON 2-WHEEL	2	2		
	462790	TRUCK UTILITY 1/4-TON 4X4	2	2		
	574770	GOGGLES SUN WIND DUST 2 PLASTIC COLORLESS NEUTRAL GRAY	2	2		506
05	540775	PARACHUTE PERSONNEL BACK 34 FT DIA ORANGE WHITE SAND AND OG	2	2		230
	562161	TABLE FOLDING LEGS WOOD TOP AND LEGS 36 L 24 W 27-25/32 IN H	4	4		
	565901	TENT GENERAL PURPOSE SMALL CYN DUCK FABRIC CO W/PINS-POLES	2	2		600
	651701	RADIO SET AN/VRC-24 MID IN TRK 1/4 TON	2	2		
	655211	RADIO SET AN/VRC-46 MID IN TRK 1/4 TON	2	2		
	678260	TELEPHONE SET 1A-312/P1	2	2		
	712730	COMPUTER AIR NAVIGATION DEAD RECKONING TYPE MB-4	2	2		250
	744410	LIFE PRESERVER UNDER ARM AIRCRAFT GAS OR ORAL INFLATION	2	2		230
	763200	PLOTTER AIRCRAFT SCALE 1 TO 500000 AND 1 TO 1000000	2	2		230
	960010	ANTENNA AT-72170	2	2		907
06						
07	401088	BAYONET KNIFE W/SCABARD FOR 7.62MM RIFLE	46	36		600
	422280	PISTOL AUTOMATIC CAL .45	32	24		
	435965	RIFLE 7.62-MM SEMIAUTOMATIC LT BARREL	16	12		
	540775	PARACHUTE PERSONNEL BACK 26 FT DIA ORANGE WHITE SAND AND OG	48	36		622
	540800	PARACHUTE PERSONNEL CHEST 28 FT ORANGE AND WHITE SAND AND OG	512	384		623
	627360	RADIO SET AN/VRC-102	4	4		517
	638650	RADIO SET AN/VRC-10	14	12		620
	678260	TELEPHONE SET 1A-312/P1	4	4		
	701250	AIRPLANE TRANSPORT	16	12		
	712730	COMPUTER AIR NAVIGATION DEAD RECKONING TYPE MB-4	32	24		250
08	744410	LIFE PRESERVER UNDER ARM AIRCRAFT GAS OR ORAL INFLATION	36	36		622
	744420	LIFE PRESERVER UNDER ARM PARACHUTIST GAS OR ORAL INFLATION 8-7	512	384		621
	763200	PLOTTER AIRCRAFT SCALE 1 TO 500000 AND 1 TO 1000000	32	24		250
	784000	TOOL KIT AIRCRAFT MECHANICS GENERAL	76	12		
09						
10						

## SECTION III. EQUIPMENT

TUE 1-590

PART NO.	ITEM NO.	DESCRIPTION	QUANTITY			REMARKS	TOTAL
			REQD.	AVAIL.	INVT.		
05	237638	HEATER SPACE COAL OR OIL 30000 BTU 10-5/8 IN. H.	2	2			600
	401088	BAYONET KNIFE W/SCABARD FOR 7.62MM RIFLE	13	13			169
	429280	PISTOL AUTOMATIC CAL. 45	1	1			
	435965	RIFLE 7.62-MM SEMIAUTOMATIC LT. BARREL	12	10			
	447110	TRAILER AMPHIBIOUS CARGO 1/4 TON 2-WHEEL	1	1			
	461790	TRUCK UTILITY 1/4-TON 6X6	1	1			
	461834	TRUCK VAN SHOP 2 1/2-TON 6X6	2	2			
	461885	TRUCK WRECKER MEDIUM 5-TON 6X6 W/MN	1	1			
	510324	CASE FIELD OFFICE WASH PLYWOOD 22-1/2 L 12-1/4 W 17 D	1	1			
	510332	CASE FIELD OFFICE WASH PLYWOOD 17-1/2 L 12-1/4 W 17 D	1	1			
	510335	CASE FIELD PLYWOOD 22 5/8 IN. W 25 7/8 IN. H 15 1/2 IN. D	1	1			
	510400	DISPENSING PUMP HAND DRIVEN PISTON TYPE 15 GAL PER 100 REV	2	2			
	524300	FILE VISIBLE INDEX BOOK UNIT METAL 40 TO 120 PAGES	1	1			
	524380	FILE VISIBLE INDEX CABINET STEEL GRAY ENAMEL 7 8 DR 7 SLIDED	3	3			
	524580	FILING CABINET CAP SIZE STEEL GRAY 33 1/2 IN. D W/LOCK	1	1			
	529130	GOGGLES SUN WIND DUST 2 PLASTIC COLORLESS NEUTRAL GREY	4	4			500
	540775	PARACHUTE PERSONNEL BACK 20 FT DIA ORANGE WHITE SAND AND CG	1	1			210
	541175	PAULIN CYN DUCK FLOOR 40 40 FT LG 20 FT W	5	5			600
	541780	PUMPING ASSY. CAMMABLE W/SHOCK PUMP TRANSFER 50 GPM 2 HP	2	2			
	542161	TABLE FOLDING LEGS WOOD TOP AND LEGS 36 L 24 W 27-25/32 IN. H	8	7			
	560829	TENT GENERAL PURPOSE MEDIUM W/SHOCK PUMP TRANSFER COMPLETE	1	1			
	560850	TENT LINER CYN PERMEABLE TENT GENERAL PURPOSE MEDIUM	1	1			600
	571325	TOOL KIT RADAR AND RADIO 77 COMPONENTS	2	2			221
	575870	TYPEWRITER MONTEBIL 13 IN. PAPER SIZE 42 TO 54 KEYS ELITE TYPE	1	1			
	575910	TYPEWRITER MONTEBIL 20 IN. PAPER SIZE 42 TO 54 KEYS ELITE TYPE	1	1			
	634670	RADIOMETER IN-93100	2	2			
	645201	RADIO SET AM/VRC-40 172 IN. JRS 1/2 TON	1	1			
	678260	TELEPHONE SET TA-31178T	1	1			
	711740	CHAIN ASSY SGL LEG W/PEAR LINKS AND 1 GRAB HOOK 5/8 IN. BY 16 FT	1	1			700
	711740	CHAIN ASSY SGL LEG W/PEAR LINKS AND 1 GRAB HOOK 5/8 IN. BY 16 FT	2	1			701
	712730	COMPUTER AIR NAVIGATION DEAD RECKONING TYPE MS-1	1	1			230
	744410	LIFE PRESERVER UNDER ARM AIRCRAFT GAS OR ORAL INFLATION	1	1			230
	763200	PLOTTER AIRCRAFT SCALE 1 TO 500000 AND 1 TO 1000000	1	1			230
	785250	TOOL SET ORGANIZATIONAL MAINTENANCE ARMY AIRCRAFT SET C	1	1			
	960010	ANTENNA AT-7911A	1	1			907
06		6. MAINTENANCE SECTIONS					
	100030	DECONTAMINATING APPARATUS PORTABLE 1 1/2-GT	4	4			600
	229910	EXT. FIRE CARSON DIXON CHARGED HAND 15 LB	4	4			
	235160	GENERATOR SET GAS ENG 1.5 KW 60 CY 1 PH 2 WIRE AC 120 V SKID MTD	4	4			600
	239620	HEATER DUST TYPE PTBL GAS 200000 BTU	4	4			600
	245076	LIGHT SET GEN TLLUM 25 OUTLET	4	4			600
	401088	BAYONET KNIFE W/SCABARD FOR 7.62MM RIFLE	30	32			
	435965	RIFLE 7.62-MM SEMIAUTOMATIC LT. BARREL	3A	32			
	457220	TRAILER CARGO 1 1/2-TON 2-WHEEL	4	4			
	460310	TRUCK CARGO 2 1/2-TON 6X6 LWB	4	4			
	515800	DISPENSING PUMP HAND DRIVEN CONTINUOUS FLOW 12 GL PER 100 REV	4	4			
	529130	GOGGLES SUN WIND DUST 2 PLASTIC COLORLESS NEUTRAL GREY	4	4			500
	545750	TENT FRAME TYPE MAINT. MED. LT. METAL FMMWR 32 FT LG	4	4			600
	560829	TENT LINER FOR 32 FT TENT FRAME TYPE MAINT. MOD. LT. METAL	4	4			625
	711740	CHAIN ASSY SGL LEG W/PEAR LINKS AND 1 GRAB HOOK 5/8 IN. BY 16 FT	1	1			700
	711740	CHAIN ASSY SGL LEG W/PEAR LINKS AND 1 GRAB HOOK 5/8 IN. BY 16 FT	4	1			701
	784040	TOOL KIT AIRCRAFT MECHANICS GENERAL	32	20			
07		AIRFIELD SERVICE SECTION					
	100030	DECONTAMINATING APPARATUS PORTABLE 1 1/2-GT	6	3			600
	229910	EXT. FIRE CARSON DIXON CHARGED HAND 15 LB	4	4			
	229920	EXT. FIRE CARSON DIXON CHARGED HAND 15 LB	4	4			
	235242	FILTER SEPARATOR L10 FUEL 50 GPM 75 PSI 2 IN. INLET 2 IN. OUTLET	2	2			
	232885	FIRE FIGHT SWIP SET TRK MTD ARMY AIRCRAFT CRASH CS. CL. 500V	1	2			

## SECTION IN EQUIPMENT

TOL 1-190

ITEM NO.	UNIT ITEM NO.	ITEM DESCRIPTION	QUANTITY			REMARKS	AFB UNIT USE
			1 QUANTITY	2 QUANTITY	3 UNIT		
05	239632	HEATER SPACE COAL OR OIL 65000 BTU 18-5/8 IN H	2	4		800	
	401688	BAYONET KNIFE W/SCABARD FOR 7.62MM RIFLE	13	11		600	
	429280	PISTOL AUTOMATIC CAL .45	1	1			
	433965	RIFLE 7.62-MM SEMIAUTOMATIC LT BARREL	12	10			
	457130	TRAILER AMPHIBIOUS CARGO 1/4 TON 2-WHEEL	1	1			
	461790	TRUCK UTILITY 1/4-TON 4X4	1	1			
	461834	TRUCK VAN SHOP 2 1/2-TON 6X6	2	2			
	461885	TRUCK WRECKER MEDIUM 5-TON 6X6 W/WH	1	1			
	510324	CASE FIELD OFFICE MACH PLYWOOD 22-1/2 L 13-1/4 W 17 D	1	1			
	510332	CASE FIELD OFFICE MACH PLYWOOD 34 1/2 L 13 1/4 W 17 IN D 10	1	1			
	510342	CASE FIELD PLYWOOD 22 5/8 IN W 25 7/8 IN H 14 1/2 IN D	1	1			
	519846	DISPENSING PUMP HAND DRIVEN PISTON TYPE 15 GAL PER 100 REV	2	2			
	524300	FILE VISIBLE INDEX BOOK UNIT METAL 40 TO 120 POCKETS	1	1			
	524380	FILE VISIBLE INDEX CABINET STEEL GRAY ENAMEL 7 H OR 9 SLIDES	1	1			
	524586	FILING CABINET LAP SIZE STEEL GRAY 33 1/2 IN D W/LOCK	1	1			
	570100	GOGGLES SUN WIND DUST 2 PLASTIC COLORLESS NEUTRAL GREY	4	4		906	
	580725	PARACHUTE PERSONNEL BACK 28 FT DIA ORANGE WHITE SAND AND OG	1	1		230	
	581175	PAULIN CYL DUCK FMWR OD 40 FT LG 20 FT W	1	1		600	
	584780	PUMPING ASSY FLAMMABLE LIQUID BULK TRANSFER 50 GPM 5 HP	2	2			
	585216	TABLE FOLDING LUGG WOOD TOP AND LEGS 36 L 24 W 27-25/32 IN H	8	7			
	585217	TENT GENERAL PURPOSE MEDIUM WITHOUT WINDOWS FMWR COMPLETE W/PINS AND POLES	1	1		600	
	586250	TENT LINER STM PERMEABLE TENT GENERAL PURPOSE MEDIUM	1	1		625	
	571323	TOOL KIT RADAR AND RADIO 47 COMPONENTS	2	2		221	
	575810	TYPEWRITER NONPBL 11 IN PAPER SIZE 42 TO 44 KEYS ELITE TYPE	1	1			
	575910	TYPEWRITER NONPBL 20 IN PAPER SIZE 42 TO 44 KEYS ELITE TYPE	1	1			
	634670	RADIO METER IM-93/UD	2	2			
	655201	RADIO SET AM/VHS-4A MTD IN IRS 1/4 TON	1	1			
	678260	TELEPHONE SET TA-312/PT	1	1			
	711740	CHAIN ASSY SGL LEG W/PEAR LINKS AND 1 GRAB HOOK 5/8 IN BY 16 FT	1	1		700	
	711740	OR COMPUTER AIR NAVIGATION DEAD RECKONING TYPE MS-A	2	2		791	
	712750	LIFE PRESERVER UNDER ARM AIRCRAFT GAS OR DUAL INFLATION	1	1		230	
	744410	PLOTTER AIRCRAFT SCALE 1 TO 50000 AND 1 TO 100000	1	1		230	
	783250	TOOL SET ORGANIZATIONAL MAINTENANCE ARMY AIRCRAFT SET C	1	1			
	960010	ANTENNA AT-791/G	1	1		907	
06		4 MAINTENANCE SECTIONS					
	108050	DECONTAMINATING APPARATUS PORTABLE 1 1/2-GT	4	4		600	
	222910	EXT FIRE CARBON DIOX CHARGED HAND 15 LB	4	4			
	225163	GENERATOR SET GAS ENG 1.4 KW 80 CY 1 PH 2 WIRE AC 170 V SKID MTD	4	4		600	
	229621	HEATER DUCT TYPE PTBL GAS 250000 BTU	4	4		606	
	249076	LIGHT SET GEN ILLUM 25 OUTLET	4	4		600	
	411088	BAYONET KNIFE W/SCABARD FOR 7.62MM RIFLE	36	32			
	423965	RIFLE 7.62-MM SEMIAUTOMATIC LT BARREL	36	32			
	457270	TRAILER CARGO 1 1/2-TON 2-WHEEL	4	4			
	461110	TRUCK CARGO 2 1/2-TON 6X6 LWB	4	4			
	515800	DISPENSING PUMP HAND DRIVEN CONTINUOUS FLOW 12 GL PER 100 REV	4	4			
	527100	GOGGLES SUN WIND DUST 2 PLASTIC COLORLESS NEUTRAL GREY	4	4		906	
	583798	TENT FRAME TYPE MAINT MED LT METAL FMWR OD 32 FT LG	4	4		600	
	586079	TENT LINER FOR 32 FT TENT FRAME TYPE MAINT MDM LT METAL	4	4		625	
	711740	CHAIN ASSY SGL LEG W/PEAR LINKS AND 1 GRAB HOOK 5/8 IN BY 16 FT	1	1		700	
	711740	OR TOOL KIT AIRCRAFT MECHANICS GENERAL	4	4		791	
	784040	TOOL KIT AIRCRAFT MECHANICS GENERAL	32	28			
07		AIRFIELD SERVICE SECTION					
	108050	DECONTAMINATING APPARATUS PORTABLE 1 1/2-GT	6	5		600	
	222910	EXT FIRE CARBON DIOX CHARGED HAND 15 LB	4	4			
	222921	EXT FIRE CARBON DIOX CHARGED HAND 50 LB	4	4			
	222542	FILTER SEPARATOR LIQ FUEL 50 GPM 75 PSI 2 IN INLET 2 IN OUTLET	2	2			
	232885	FIRE FIGHT EQUIP SET TRK MTD ARMY AIRCRAFT CRASH QS GL 210V	1	1			

## 22 2090

7-11-78 10:00 AM



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(U) ANNEX F

## DATA COLLECTION FORMS

Annex F contains the data collection forms used during the CV-2B evaluation.

Form	Page
Evaluators Mission Report	F-2
Mission Report, Airdrop Techniques	F-5
Maintenance Data, Scheduled Maintenance	F-7
Maintenance Data, Job Order Register	F-8
Supply Data, Requisition Summary	F-9
Maintenance Data, Battle Damage	F-10
Maintenance Data, Recapitulation	F-11
Crew Chief Work Log	F-12
Aircraft Hit Report	F-13

CV-2B (CARIBOU) EVALUATION  
EVALUATORS MISSION REPORT

REPORT EVALUATION AREA

- (Date) \_\_\_\_\_
- 1) DTG Mission Received: \_\_\_\_\_ Crew: \_\_\_\_\_  
A/C Comdr
  - 2) Mission No: \_\_\_\_\_  
Pilot
  - 3) Type Mission: \_\_\_\_\_  
Crew Chief
  - 4) DTG Scheduled Take Off/Return: \_\_\_\_\_  
Asst Crew Chief
  - 5) DTG Actual Time of Departure/Return: \_\_\_\_\_
  - 6) Delays (Length & Type): \_\_\_\_\_
  - 7) Flight Route: \_\_\_\_\_
  - 8) Altitude: \_\_\_\_\_
  - 9) Approach and Landing Technique (Selected): \_\_\_\_\_  
a) Pattern: \_\_\_\_\_  
b) Altitude: \_\_\_\_\_  
c) Flap Setting: \_\_\_\_\_  
d) Angle of Descent/Rate of Descent: \_\_\_\_\_  
e) Landing Roll: \_\_\_\_\_  
f) Winds/Density Altitude: \_\_\_\_\_
  - 10) Landing Area (Selected): \_\_\_\_\_  
a) Length/Width: \_\_\_\_\_  
b) Obstructions: \_\_\_\_\_  
c) Composition of Landing Area: \_\_\_\_\_  
d) Condition of Landing Area: \_\_\_\_\_  
e) Communications: \_\_\_\_\_  
f) Loading/Unloading Procedure: \_\_\_\_\_

11) Take Off Technique: \_\_\_\_\_ (Normal) \_\_\_\_\_ (Maximum Performance) \_\_\_\_\_ (Flap Setting)

12) Enemy Situation: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

13) Weather: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

14) Evasive Action Taken: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

15) Special Techniques Used (Describe): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

16) Communication/Radar/Navigation Equipment Used: \_\_\_\_\_ Time Operated

a) Single Band Radio:

b) UHF/VHF/FM:

c) Weather Avoidance Radar:

d) ADF/Omni/Doppler/Decca:

e) Describe Malfunctions: \_\_\_\_\_  
\_\_\_\_\_

f) Contribution of Equipment to Mission Accomplishment: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

17) Aircraft Maintenance Problems: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

18) Summary: Pax Hauled/Pax Miles: \_\_\_\_\_

Type & Amount Cargo/Cargo Miles: \_\_\_\_\_

Total A/C Flying Time: \_\_\_\_\_

Weather Time: \_\_\_\_\_

C/A, C/S, S/A Time:

Number Missions/Sorties:

Remarks:

(Evaluators Name) (Rank)

(Branch) (Title)

A/C Comdr/Pilot/Observer

# DATA COLLECTION RECORD: Caribou CHM15 .A

## AIR DROP TECHNIQUES CARIBOU EVALUATION

Date: \_\_\_\_\_ Mission No: \_\_\_\_\_

Evaluator: \_\_\_\_\_

1. Mission: Cargo \_\_\_\_\_

Personnel \_\_\_\_\_

Daylight-Dark \_\_\_\_\_

DTG Requested \_\_\_\_\_

DTG Requested For \_\_\_\_\_

DTG Scheduled \_\_\_\_\_

DTG Executed \_\_\_\_\_

2. Method of Delivery: \_\_\_\_\_ (Check) \_\_\_\_\_ (Type Parachute)

Heavy Drop \_\_\_\_\_

Door Bundles \_\_\_\_\_

LOLEX \_\_\_\_\_

HIVEL \_\_\_\_\_

Gravity Drop \_\_\_\_\_

3. Delivery site/Drop zone: \_\_\_\_\_

(a) Size (Length/Width) \_\_\_\_\_

(b) Elevation \_\_\_\_\_

(c) Describe DZLZ surrounding terrain \_\_\_\_\_

(d) Describe terminal guidance used \_\_\_\_\_

4. Flight Techniques: MARKET HOTTOLAND 1775

Drop Airspeed 210 KNOTS

Drop Altitude 10000

Number of passes over DZ 1

Time over DZ 10

Ground fire (Yes, No) NO

Evasive action by A/C crew NO

5. Effectiveness of drop:

Estimate of accuracy 100%

(% on DZ)

Percent lost, damaged 0

6. Weather:

(sky cover) 0

(aloft) 0

(ground) 0

(winds) 0

(visibility) 10

(ceiling) 10

7. Evaluators Comments:

11-11-61

### Scheduled Organizational Maintenance

100-37170-20A

[illegible]

REMARKS:



## DATA COLLECTION RECORD

DATE:

WIN SUPPORTED:

TYPE SUPPORT (DS - CS)

UNIT SUPPORT INC

# JOB ORDER REGISTER

[illegible]

REMARKS:

ACTIV FORM  
(29 July 1964)

**ANNEX F:**

# DATA COLLECTION RECORD

DATE: \_\_\_\_\_

DATE: \_\_\_\_\_

DATE: \_\_\_\_\_

DATE: \_\_\_\_\_

DATE: \_\_\_\_\_

DATE: \_\_\_\_\_

EXHIBITION MONTHLY SUMMARY

DATE: \_\_\_\_\_

CODE	02	05	12	17
Submitted				
Received				
Due-In				
Refill-Time (Days)				
Grand Total				
Total Filled				
Percent Filled				

REMARKS: \_\_\_\_\_

[illegible]

## Battle Damage

## Summary of Aircraft Hits

[illegible]

Average Number Hits: \_\_\_\_\_

Average Altitude: \_\_\_\_\_

**Average Man-Hours:** \_\_\_\_\_

REMARKS:

# DATA COLLECTION RECORD

## Recapitulation Organizational Maintenance

Date: \_\_\_\_\_

Acft SN	PE	Acft SN	PE	Acft SN	PE	Acft SN	PE
DM		DM		DM		DM	
DI		DI		DI		DI	
INT		INT		INT		INT	

Total: \_\_\_\_\_ Total: \_\_\_\_\_ Total: \_\_\_\_\_ Total: \_\_\_\_\_

Acft SN	PE	Acft SN	PE	Acft SN	PE	Acft SN	PE
DM		DM		DM		DM	
DI		DI		DI		DI	
INT		INT		INT		INT	

Total: \_\_\_\_\_ Total: \_\_\_\_\_ Total: \_\_\_\_\_ Total: \_\_\_\_\_

Acft SN	PE	Acft SN	PE	Acft SN	PE	Acft SN	PE
DM		DM		DM		DM	
DI		DI		DI		DI	
INT		INT		INT		INT	

Total: \_\_\_\_\_ Total: \_\_\_\_\_ Total: \_\_\_\_\_ Total: \_\_\_\_\_

Acft SN	PE	Acft SN	PE	Acft SN	PE	Acft SN	PE
DM		DM		DM		DM	
DI		DI		DI		DI	
INT		INT		INT		INT	

Total: \_\_\_\_\_ Total: \_\_\_\_\_ Total: \_\_\_\_\_ Total: \_\_\_\_\_

REMARKS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

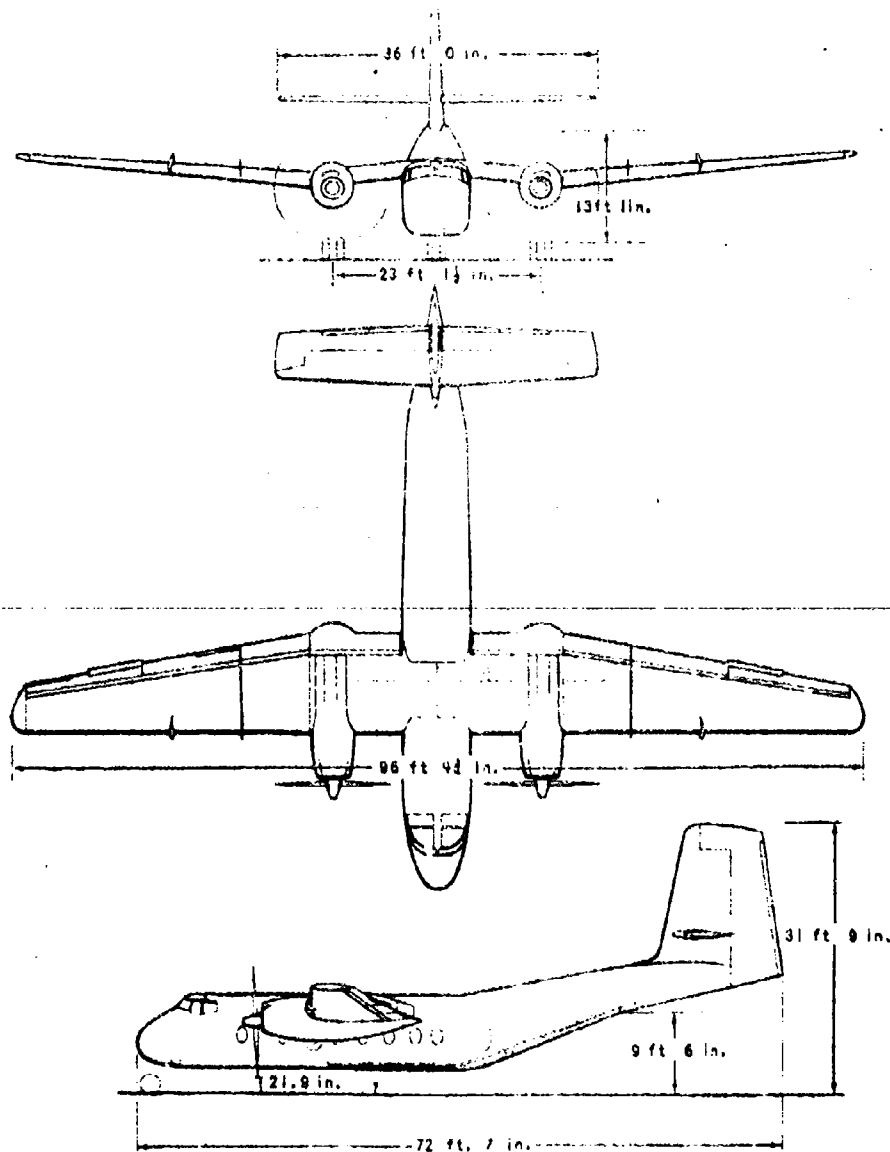
ACTIV Form  
(28 July 1964)

CREW CHIEF WORK LOG

NAME \_\_\_\_\_

DATE \_\_\_\_\_

1. I was awakened at \_\_\_\_\_ hours.
2. I began work at \_\_\_\_\_ hours.
3. Preparation of my aircraft for flight took \_\_\_\_\_  
hours mins
4. Take off time was \_\_\_\_\_ hours.
5. Total flying time for the day was \_\_\_\_\_  
hours mins
6. Total number of operational stops was \_\_\_\_\_
7. Total number of passengers hauled was \_\_\_\_\_
8. Total amount of cargo hauled \_\_\_\_\_
9. Time spent for lunch break was \_\_\_\_\_  
hours mins
10. Total time spend for refueling and servicing my aircraft was \_\_\_\_\_  
hours mins
11. Final landing time was \_\_\_\_\_ hours.
12. My after-flight maintenance and daily inspection took \_\_\_\_\_,  
hours mins  
including myself there were \_\_\_\_\_ people doing the work.
13. I finished work at \_\_\_\_\_ hours.  
☐ I ate supper after work.  
☐ I took a \_\_\_\_\_ supper break.  
hour mins
14. I \_\_\_\_\_ have an assistant crew chief during the  
(did) (didn't)  
flight.
15. REMARKS: (include anything unusual that caused you extra work or  
difficulty; such as demand maintenance during the day or unusual  
loading problems.) \_\_\_\_\_



Date of Hit \_\_\_\_\_

Geographical Location  
of Aircraft \_\_\_\_\_

Number of  
Hits \_\_\_\_\_

Altitudes of Aircraft  
When Hit \_\_\_\_\_

Location of  
Hits on  
Aircraft \_\_\_\_\_

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(U) ANNEX G

DISTRIBUTION

Office of the Chief of Staff of the Army (ATTN: Director of Coordination and Analysis, Coordination Division)	2
Deputy Chief of Staff for Personnel Department of the Army	2
Deputy Chief of Staff for Logistics Department of the Army	2
Deputy Chief of Staff for Military Operations Department of the Army	5
Assistant Chief of Staff for Intelligence (ATTN: Director of Surveillance and Reconnaissance, Doctrine Division)	2
Assistant Chief of Staff for Force Development Department of the Army	10
Office of the Assistant Chief of Staff for Force Development, ATTN: ACTIV Liaison Officer, Department of the Army	10
Chief of Research and Development (ATTN: Special Warfare Office) Department of the Army	3
Office of the Chief of Communications-Electronics Department of the Army	4
Commanding General, US Army Materiel Command	35
Office of Personnel Operations Department of the Army	2
Office of the Surgeon General Department of the Army	1
Commanding General, US Continental Army Command	30
Commander-in-Chief, US Army Pacific	5
Commanding General, US Army Combat Developments Command	50



Joint Test and Evaluation Task Force (JTETF) USSTRICOM MacDill AFB, Fla. (ATTN: Major General Rossop)	1
Commandant, Command and General Staff College	2
Commandant, US Army War College	2
Commanding General, Defense Documentation Center	20
Commanding General, 11th Air Assault Division	5
Commandant, The Infantry School, ATTN: AJIIS-A	3
Commandant, The Armor School	2
Commandant, US Army Artillery and Missile School	2
Commanding General, US Army Engineer School	10
Commanding General, US Army Special Warfare School	2
Commanding General, US Army Civil Affairs School	1
Commandant, Signal School, US Army Signal Center	4
Commanding General, US Army Electronics Proving Ground	4
Commanding General, US Army Aviation Center	5
Commanding General, US Army Forces Southern Command (ATTN: SCARCD)	3
Commanding Officer, US Army Limited War Laboratory	2
Commander, US Military Assistance Command, Vietnam	15
Commanding General, US Army Support Command, Vietnam	20
Director, Joint Research and Test Activity (For distribution to COMUSMACV and CINCPAC)	6
Chief, OSD ARPA R & D Field Unit, Vietnam	5
Chief, OSD ARPA R & D Field Unit, Thailand	1
Commanding Officer, US Army Special Forces, Vietnam	10
Director, United States Overseas Mission Saigon, Vietnam	1

Commanding General, USAREUR, ATTN: G-3	5
Commanding General, Seventh US Army, ATTN: G-3	5
Commanding General, USARCIB	1
Commanding General, US Army Test & Evaluation Command	1
Commanding General, US Army Ordnance Center & School	1
Commanding General, US Army Mobility Command	1
Commanding General, US Army Special Forces Fort Bragg, North Carolina	1
Commanding Officer, Combat Developments Command Special Warfare Agency, Fort Bragg, North Carolina	2
President, US Army Armor Board	1
President, US Army Infantry Board	1
President, US Army Aviation Test Board	2
Commanding Officer, Combat Developments Command Aviation Agency, Ft Rucker, Alabama	3
Commanding Officer, US Army Special Forces, Okinawa	2
Commanding General, US Army Special Warfare Center Fort Bragg, North Carolina	2
Commanding Officer, 1st Psychological Warfare Battalion (B&L) Fort Bragg, North Carolina	1
Commanding Officer, 5th Psychological Warfare Co (Field Army) Germany	1
Commanding Officer, 13th Psychological Warfare Battalion (B&L)	1
Commanding Officer, USAB&VPAC, APO US Forces 96331	2
Chief of Naval Operations, Department of the Navy Washington, D.C. 20310	1

Bureau of Naval Weapons, Department of the Navy 1  
ATTN: Asst Chief for RDT&E, Washington, D.C. 20310

Commandant, U.S. Marine Corps, Washington, D.C. 20310 1

Deputy Chief of Staff (P&D), Hq, U.S. Marine Corps 1  
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Assistant Chief of Staff G-3, Hq, U.S. Marine Corps 1  
Washington, D.C. 20310

Director, Marine Corps Landing Forces Development Center 1  
Quantico, Virginia

Headquarters, U.S. Air Force, Washington, D.C. 20310

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AFRDD 1

AFRDP 1

AFPRQ 1

AFORQT 1

AFXFDA 1

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Andrews Air Force Base, Washington, D.C. 20331

Commander, Air Proving Ground Center, ATTN: PCBAP-1 1  
Eglin AFB, Florida

Headquarters, Research & Technology Division 1  
ATTN: RTTN, Bolling AFB, Washington, D.C.

Air Force Avionics Laboratory, ATTN: AVP 1  
Wright-Patterson AFB, Ohio 45433

Headquarters, Aeronautical Systems Division, ATTN: ASJ Wright-Patterson AFB, Ohio 45433	1
Headquarters, Aeronautical Systems Division, ATTN: ASZ Wright-Patterson AFB, Ohio 45433	1
Headquarters, Aeronautical Systems Division, ATTN: ASR Wright-Patterson AFB, Ohio 45433	1
Air Force Flight Dynamics Laboratory, ATTN: FDG Wright-Patterson AFB, Ohio 45433	1
Air Force Aero Propulsion Laboratory, ATTN: APS-Maj D.L. Sumner Wright-Patterson AFB, Ohio 45433	1
Systems Engineering Group, ATTN: SESJ, Director of Limited War Wright-Patterson AFB, Ohio 45433	1
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Headquarters, Tactical Air Command, ATTN: DORQ Langley AFB, Virginia	1
Headquarters, Tactical Air Command, ATTN: DMEM-AC Langley AFB, Virginia	1
Headquarters, Tactical Air Command, ATTN: DORF-SW Langley AFB, Virginia	1
Commander, 1st Air Command Wing, Hurlburt Field, Florida	1
Commander, Special Air Warfare Center, Eglin AFB, Florida	1
Commander, 1st Combat Application Group Eglin AFB, Florida 32542	1
Headquarters, Pacific Air Force, ATTN: PFORQ Hickam AFB, Hawaii	1
Headquarters, Pacific Air Force, ATTN: PFLPL Hickam AFB, Hawaii	1
Headquarters, Pacific Air Force, ATTN: PFMS Hickam AFB, Hawaii	4
Commander, Tactical Air Warfare Center Eglin AFB, Florida 32542	1
Commander, 2d Air Div, 13th Air Force, APO US Forces 96307	2
Commander, 13th Air Force, APO US Forces 96274	2